Ossining, New York

Village of Ossining Multi-Modal Transportation Hub

2025

Project Specifications

Issue for Bid
02/21/2025

www.tha-consultanting.com

144 Livingston Avenue
New Brunswick, NJ 08901
T. 732.253.0690

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1.1 LIST OF DRAWINGS

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VILLAGE OF OSSINING
WESTCHESTER COUNTY, NEW YORK

CONTRACT NUMBERS:

DPW-25-07G – GENERAL CONSTRUCTION
DPW-25-07P – PLUMBING AND FIRE SUPPRESSION CONSTRUCTION
DPW-25-07M – MECHANICAL CONSTRUCTION
DPW-25-07E – ELECTRICAL CONSTRUCTION

Multi-Modal Transportation Hub Construction

Prepared by:

VILLAGE OF OSSINING DPW
JOHN-PAUL RODRIGUES OSSINING OPERATIONS CENTER
101 ROUTE 9A, P.O. BOX 1166
OSSINING, N.Y. 10562

CALGI CONSTRUCTION COMPANY, INC.
56 LAFAYETTE AVENUE, SUITE 350
WHITE PLAINS, NY 10603

THA ARCHITECTURE & ENGINEERING, P.C.
144 LIVINGSTON AVENUE
NEW BRUNSWICK, NJ 05901

APRIL 2025

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NOTICE TO BIDDERS

VILLAGE OF OSSINING
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:

DPW-25-07G: Multi-Modal Transportation Hub General Construction
DPW-25-07P: Multi-Modal Transportation Hub Plumbing & Fire Suppression Construction
DPW-25-07M: Multi-Modal Transportation Hub Mechanical (HVAC) Construction
DPW-25-07E: Multi-Modal Transportation Hub Electrical Construction

The principal feature of the work to be performed is construction of a new multi-modal transportation hub including a 242-space open parking garage, EV bike shelter, and repair shop.

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, on Monday June 16, 2025, at which time they will be publicly opened and read.

OBTAINING DOCUMENTS: The Contract Documents, including Drawings and Specifications, may be obtained beginning on Monday, May 12, 2025. Documents are available electronically at no cost to prospective bidders. Interested parties should email kdoherty@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 Thursday, May 22, 2025 at 10:00 AM at the Multi-Modal Transportation Hub construction site, 3 Brandreth Street, 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 : 5/1/25

SECTION I – INFORMATION FOR BIDDERS

SECTION I
INFORMATION FOR BIDDERS

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, Monday, June 16, 2025** 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: **Multi-Modal Transportation Hub Construction**
Contract No. DPW-25-07

Please indicate which contract is being bid: General, Plumbing, Mechanical, or Electrical

Attention: Susanne Donnelly, Village Clerk
Municipal Building
16 Croton Avenue
Ossining, N.Y. 10562

Opening: **Monday, June 16, 2025**
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 28-30)
- Iran Divestment Act of 2021 certification (Bidder's proposal at page 31)
- Bidder's qualifications (Bidder's proposal at pages 33-34)
- Registration for contractors and subcontractors (with current registration certificates) (Bidder's proposal at page 35)
- Minority and women-owned business certification (Bidder's proposal at page 36)
- Bidder's acknowledgement of addenda (Bidder's proposal at page 37)
- Bidder's proposal (Bidder's proposal at pages 38-44)
- Bidder's acknowledgement of proposal (Bidder's proposal at pages 45-46)
- 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:

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.

MANDATORY PRE-BID JOB MEETING: The bidders are advised that a mandatory pre-bid job walk-through will be held by the owner for the purpose of addressing contractors' questions during the bidding process. The conference will be held as follows:

Date: Thursday, May 22, 2025
Time: 10:00 a.m.
Place: Multi-Modal Transportation Hub Construction Site, 3 Brandreth Street, Ossining, NY 10562

All contractors who will be submitting bids for this work must have a representative present at the pre-bid meeting. No bid received for this work will be considered for contract award unless a bidder representative was present at the aforesaid pre-bid meeting.

J. SCOPE OF WORK

The principal feature of the work to be performed is the construction of a new multi-modal Transportation Hub including a 242-space open parking garage, EV bike shelter, and repair shop. See Technical Specification Section 011000 Summary for further details.

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 thirty-five (335) calendar days after contract signing. The Contractor shall provide the project, ready for final acceptance, inclusive of all punch list and project close out documents within 365 calendar days from the contract signing.**

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 Work includes, but is not limited to:

Site demolition including trees and utilities relocation.
New site work including: grading/drainage; landscaping including plaza with pavement, trees, and plants; site lighting; site furniture.
242-space, precast open parking garage - one ground with three supported levels.
Select area of exterior façade treatment.
Twelve EV spaces with infrastructure for future EVs.
Interior and exterior building lighting.
Security cameras.
E-bike share shelter with enclosed repair shop, toilet room, and storage.
Outdoor/covered e-bike charging stations, e-bike battery charging lockers, and standard bike racks.

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.

3. Number and classification of employees to be assigned to the work including those of any proposed subcontractors.

The successful Bidder shall submit a construction schedule, in a form acceptable to the Village, for approval before being permitted to start work. See Technical Specification 011250 Summary of Prime Contractors and Technical Specification Section 013216 Progress Schedule for further information.

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.

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
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 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. The Village of Ossining will use its best efforts to encourage, promote and increase participation of business enterprises owned and controlled by persons of color or women (MBE/WBE) in contracts and projects funded by the Village and to develop a policy to efficiently and effectively monitor such participation. 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 or the Charter and Local Laws of the Village of Ossining. Bidders are referred to section CC, **Requirements of the New York State Department of State**, for additional requirements regarding minority and women-owned business participation policy.

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

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."

Z. PIGGYBACK CLAUSE

General Municipal Law section 103 provides, "Notwithstanding the provisions of subdivisions one, two and three of section 103 of the General Municipal Law and section 104 of the General Municipal Law, any officer, board or agency of a political subdivision or of any district therein authorized to make purchases of apparatus, materials, equipment or supplies, or to contract for services related to the installation, maintenance or repair of apparatus, materials, equipment, and supplies, may make such purchases, or may contract for such services related to the installation, maintenance or repair of apparatus, materials, equipment, and supplies, as may be required by such political subdivision or district therein through the use of a contract let by the United States of America or any agency thereof, any state or other political subdivision or district therein if such contract was let to the lowest responsible bidder or on the basis of best value in a manner consistent with section 103 and made available for use by other governmental entities; provided, however, that no political subdivision or district therein, other than a city with a population of one million or more inhabitants or any district, board or agency with jurisdiction exclusively therein, may make such purchases or contract for such services through the use of such a contract on the basis of best value in a manner consistent with section 103 of the General Municipal Law unless the political subdivision or district shall first adopt a local law, rule, regulation or resolution, as the case may be, pursuant to subdivision one of section 103, authorizing the use of best value for awarding purchase contracts."

Per General Municipal Law section 103(16), this Contract will be made available to other municipal entities seeking the same services upon consent of the Contractor. If the Contractor consents, the Contractor will honor the pricing in the Contract to any municipality or government agency authorized to piggyback. Minor changes in terms and conditions may be negotiated by participating municipalities or government agencies. Any liability resulting from piggyback purchasing using this Contract shall be the sole responsibility of the municipality or government agency contracting for the services.

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. REQUIREMENTS OF THE NEW YORK STATE DEPARTMENT OF STATE

In April, 2024, the Village and the New York State Department of State ("State") entered into a Master Contract for Grants ("Master Contract") providing for $4,243,000 in funding for the Market Square Public Plaza and Multi-Modal Transportation Center. The funding is part of the $10,000,000 Downtown Revitalization Initiative grant awarded to the Village. The Master Contract and the attachments thereto impose certain requirements on the Village as contractor and the Village's subcontractors, which includes the contractors for the Multi-Modal Transportation Center project. These requirements are in addition to the requirements detailed in the contract documents.

- The Village agrees not to enter into any subcontracts, or revisions to subcontracts, that are in excess of $100,000 for the performance of obligations under the Master Contract until the Village has received the prior written permission of the State which shall have the right to review and approve each and every subcontract in excess of $100,000 prior to giving written permission to the Village to enter into the subcontract (contract with prime contractors).
- The work performed by the subcontractor must be in accordance with the terms of the Master Contract.
- Nothing contained in the Master Contract shall impair the rights of the State under the Master Contract.
- Nothing contained in the subcontract, nor under the Master Contract, shall be deemed to create any contractual relationship between the subcontractor and the State.
- Prior to executing a subcontract, the Village agrees to require the subcontractor to provide to the State the information the State needs to determine whether a proposed subcontractor is a responsible vendor.
- When a subcontract equals or exceeds $100,000, the subcontractor must submit a Vendor Responsibility Questionnaire.
- Subcontractors are 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.

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 and constitutional non-discriminatory provisions, the Village and

subcontractors 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 or domestic victim 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 Village agrees that neither it nor its subcontractors shall by reason of race, creed, color, disability, sex, or national origin: a) discriminate in hiring against 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. The Village and subcontractors shall be subject to fines of $50.00 per person per day for any violation of section 220-e of the Labor Law.

Minority and Women Owned Business Participation

Article 15-A of the New York State Executive Law, as amended, authorized the creation of a Division of Minority and Women's Business Development to promote employment and business opportunities on state contracts for minorities and women. Under this statute, State agencies are charged with establishing business participation goals for minorities and women. The Department of State administers a Minority and Women-owned Business Enterprises (MWBE) Program as mandated by Article 15-A.

The Village agrees, in addition to any other non-discrimination provision of the Contract and at no additional cost to the Department of State to fully comply and cooperate with the Department of State in the implementation of the New York State Executive Law. These requirements include equal employment opportunities for minority group members and women ("EEO") and contracting opportunities for New York State certified minority and women-owned business enterprises ("MWBEs"). For the purposes of this Contract the specific MWBE goal and the breakdown between the Minority-owned Business Enterprise ("MBE") and the Women-owned Business Enterprise ("WBE") utilization goals are as follows:

- **MBE Goal 15%**
- **WBE Goal 15%**

Equal Employment Opportunity

Each subcontractor performing work on the Multi-Modal Transportation Center project shall undertake or continue existing EEO programs to ensure that minority group members and women are afforded equal employment opportunities without discrimination because of race,

creed, color, national origin, sex, age, disability or marital status. For these purposes, EEO shall apply in the area of recruitment, employment, job assignment, promotion, upgrading, demotion, transfer, layoff, or termination and rates of pay or other forms of compensation.

If the Village or any of the subcontractors do not have an existing EEO policy statement, the State may require the Village or subcontractors to adopt a model statement. The Village and subcontractors' EEO policy statement shall include the following language:

- The subcontractor will not discriminate against any employee or applicant for employment because of 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 subcontractor shall state in all solicitations or advertisements for employees that in the performance of the subcontract, 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 subcontractor shall request each employment agency, labor union, or authorized representative of workers with which it has a collective bargaining 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 subcontractor's obligations.

Subcontractors shall submit Workforce Utilization Reports in such form as shall be required by the State on a monthly basis for construction contracts.

Representatives of the State shall make periodic inspections of the project both during and after its completion to ensure compliance with the Master Contract, The Village shall allow the State unrestricted access to work during the preparation and progress of the work and provide for such access and inspection by the State in all construction contracts relating to the Multi-Modal Transportation Center construction.

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 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 of 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

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:

F. BIDDER'S ACKNOWLEDGMENT OF ADDENDA

The undersigned acknowledges receipt of Addenda as listed below and represents that any additions or modifications to, or deletions from the work called for in these Addenda, are included in the Base Bid Sum, if affected thereby.

ADDENDA NO.	DATED
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Bidder Signature _____

Bidder Title _____

VILLAGE OF OSSINING
WESTCHESTER COUNTY, NEW YORK

G. BIDDER'S PROPOSAL

Multi-Modal Transportation Hub Construction
Contracts DPW-25-07G, DPW-25-07P, DPW-25-07M, and DPW-25-07E

1.1 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: Multi-Modal Transportation Hub Construction, Village of Ossining, NY

TRADE	CONTRACT NO.	CHECK ONE
General Construction	DPW-25-07G	
Plumbing and Fire Suppression Construction	DPW-25-07P	
Mechanical (HVAC) Construction	DPW-25-07M	
Electrical Construction	DPW-25-07E	

D. The bidder by making a bid represents that:
   a. The bidder has read and understands the bidding documents titled Multi-Modal Transportation Hub Construction and the bid is made in accordance therewith;
   b. 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;
   c. The bidder has visited the site, become familiar with local conditions under which the work is to be performed and has correlated the bidder's personal observations with the requirements of the proposed contract documents;
   d. The bid is based upon the materials, equipment, and systems required by the bidding documents without exception.

E. Addenda:
   a. The bidder acknowledges receiving addenda and including the addenda when preparing the bid proposal.
   b. Indicate the addenda numbers received:

F. Bid:

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

BID: $_____(Numerical amount)

(_____Dollars) (Written amount)

In the event of a discrepancy or unclear bid, the price in words shall govern.

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

H. General Construction Contract No. DPW-25-07G:

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

Item	Unit of Measure	Unit Price Add	Unit Price Deduct
Trench Rock Excavation	Cubic Yard		
Bulk Rock Excavation	Cubic Yard		
Exterior Bulk Excavation	Cubic Yard		
Exterior Trench and Culvert Excavation	Cubic Yard		
Replacement of Unsuitable On-Site Materials			
Utilities Excavation	Linear Foot		
Cast-In-Place Concrete	Cubic Yard		
Concrete Slab-On-Grade	Square Foot		
Structural Steel	Pounds		
Graphic Tensile Membrane	Square Foot		

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

I. Plumbing and fire suppression Contract No. DPW-25-07P:

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		
RPZ Assembly	Each		
Pendant Exposed Sprinkler Head	Each		
Upright Sprinkler Head	Each		
Sidewall Sprinkler Head	Each		
Tamper Switch	Each		
Flow Switch	Each		

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

J. Mechanical (HVAC) Contract No. DPW-25-07M:

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		
Diffuser, Grille	Each		

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

K. Electrical Contract No. DPW-25-07E:

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-3/4" C	Per 20 Feet		
5#10, 1#10G-3/4" 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		
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	Each		

Switch			

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

L. Execution

1. The undersigned Bidder will accomplish all work required by the Bidding Documents and will provide Substantial Completion within **335 calendar days** from the contract signing, and will provide the project, ready for final acceptance, inclusive of all punch list and project close out documents within **365 calendar days** from the contract signing.
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.

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 a current power of attorney attached certifying the agent's authority to bind the Bidder.

Dated: _____

Name of Company: _____

(Affix corporate seal here if applicable)

Address: _____

_____

_____

Signature: _____ Title: _____

Print Name: _____

Phone:_____ Fax:_____

Email: _____

Federal ID Number _____

Seal
(If the bid is
by a corporation)

Acknowledgement by Contractor, if a corporation.

State of New York
County of:

On this ____ day of _____, 20___, 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 thereto by like order.

Seal

NOTARY PUBLC

H. 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 thirty-five (335)** calendar days from the Contract Signing 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 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.

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 **THA Architecture & Engineering, P.C., Calgi Construction Company, Inc.** or their authorized representatives.

A-16. Provide

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

A-17. Furnish

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

A-18. Install

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

A-19. Owner

Shall mean the “Village of Ossining”.

B. AUTHORITY OF VILLAGE ENGINEER AND ENGINEER

B-1. General

The Village Engineer/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 Village Engineer/Engineer may stop any work under the contract 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 Village Engineer/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 Village Engineer/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 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/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/Engineer, 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 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 Village Engineer/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 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 THE CONTRACTOR

C-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 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.

C-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.

C-3. Contractor to Provide Engineering

Unless otherwise specified in this Contract, the Contractor shall provide his own 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.

C-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 Village Engineer/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/Engineer without delay and to supply promptly such materials, equipment, tools, labor, and incidentals as may be required.

C-5. Contractor's Mistakes

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

C-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/Engineer.

If, in the opinion of the Village Engineer/Engineer, the Contractor is not employing sufficient labor or sufficient equipment in good repair to complete this contact 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.

C-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 of agents shall be obliged to pay by reason of any infringement of patents used in the construction and completion of the work.

C-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.

C-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. TIME

D-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 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 contact.

D-2. To Complete Work

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.

D-3. Delay, Suspension and Extension

The 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.

D-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 thirty-five (335)** calendar days after Contract Signing, 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.

D-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/Engineer for any cause which the Village Engineer/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/or 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.

D-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.

E. INSURANCE AND INDEMNITY

E-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, **THA Architecture & Engineering, P.C.**, and **Calgi Construction Company, Inc.** 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, **THA Architecture & Engineering, P.C.**, and **Calgi Construction Company, Inc.** 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, **THA Architecture & Engineering, P.C.**, and **Calgi Construction Company, Inc.** 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 the Multi-Modal Transportation Hub site. Workers' Compensation shall have unlimited coverage. Such insurance also shall include Employer's Liability in an amount not less than $2,000,000 per accident, $2,000,000 per employee, and $2,000,000 policy limit. 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, **THA Architecture & Engineering, P.C.**, and **Calgi Construction Company, Inc.** shall be included in a waiver of subrogation clause without the need for a contract or agreement.

- **Commercial General Liability**- Such policy shall include the following coverages: i) bodily injury and property damage; ii) products/completed operations; iii) personal and advertising injury; and iv) blanket contractual liability. The products and completed operations coverage shall be maintained for three (3) years after final payment. The contractor shall furnish the Village and additional insureds with evidence of continuation of coverage at final payment and for three years thereafter. Minimum policy limits for Commercial General Liability coverage shall be: i) Products/completed operations $2,000,000; ii) Personal and advertising injury-**$2,000,000**; iii) Bodily injury and property damage - **$2,000,000** per occurrence; iv) Sexual molestation and abuse - **$2,000,000** per

occurrence; v) General Aggregate - **$4,000,000**. The policy shall include the following provisions: i) **the Village of Ossining, its elected and appointed officials and employees, THA Architecture & Engineering, P.C. and Calgi Construction Company, Inc. shall be named as additional insureds 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 non-contributory basis, including any self-insured retentions without the need for a contract or agreement.** The additional insured endorsement shall be provided with the Certificate of Insurance; ii) to the fullest extent permitted by New York law, the contractor waives all rights of subrogation or similar rights against the Village of Ossining, **THA Architecture & Engineering, P.C.**, and **Calgi Construction Company, Inc.**; iii) coverage to be written on an occurrence basis; iv) coverage shall include labor law and third-party over claims; v) the clause "other insurance provisions" in a policy in which the Village is named as an insured shall not apply to the Village; vi) the insurance company issuing the policy shall have no recourse against the Village, **THA Architecture & Engineering, P.C.**, and **Calgi Construction Company, Inc.** for payment of any premium under the policy; and vii) any and all deductibles shall be the Contractor's sole responsibility.

- **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, THA Architecture & Engineering, P.C., and Calgi Construction Company, Inc. 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, **THA Architecture & Engineering, P.C.**, and **Calgi Construction Company, Inc.**; 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**- **$5,000,000** per occurrence and **$5,000,000** 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, THA Architecture & Engineering, P.C., and Calgi Construction Company, Inc. 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, **THA Architecture & Engineering, P.C.** and **Calgi Construction Company, Inc.**; 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.

- **Contractor's Pollution Liability Insurance**- The General Contractor shall purchase and maintain a policy for third party injury and property damage including cleanup costs as a result of pollution conditions arising from the General Contractor's operations and completed operations. This insurance with minimum policy limits of **$2,000,000** per occurrence and **$4,000,000** general aggregate shall be maintained for no less than three years after final completion.

- **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.

F. LABOR

F-1. No Discrimination in Employment

The Contractor agrees:

(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 fifty ($50.00) 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.

F-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.

F-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 from is to be situated, erected or used and shall be paid in cash.

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 from 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 that 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 # 2025003396**) shall be paid and provided to laborers, workmen or mechanics in carrying out the work provided for under this contract.

G. LAWS AND REGULATIONS

G-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.

G-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.

G-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).

G-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.

G-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.

G-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.

H. EXTRA WORK

H-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. Refer to Contract Specifications, section 01 25 00, contract Modifications.

H-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.

H-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.

H-4. Subcontractors

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

H-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.

H-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.

H-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.

I. PAYMENT

I-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 Engineer/Engineer.

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/Engineer.

I-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.

I-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.

I-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.

I-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.

I-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.

I-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.

I-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.

I-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.

I-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.

I-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.

I-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.

I-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.

I-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.

I-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.

I-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.

J. PERIOD OF MAINTENANCE

J-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.

J-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.

J-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.

J-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.

J-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.

K. MISCELLANEOUS CONTRACT DATA

K-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.

K-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.

K-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.

K-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.

K-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.

K-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.

K-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.

K-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.]

L. 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

Village Seal

_____

BY: Karen D'Attore
Village Manager

CONTRACTOR

Signature: _____

BY: Print: _____

Title: _____

Contractor's Corporate Seal (if any)

Company Name: _____

Address: _____

_____

Designated Representative: Name:_____

Title:_____

Address:_____

_____

Phone:_____

Email:_____

For contract:

TRADE	CONTRACT NO.	CHECK ONE
General Construction	DPW-25-07G	
Plumbing and Fire Suppression Construction	DPW-25-07P	
Mechanical (HVAC) Construction	DPW-25-07M	
Electrical Construction	DPW-25-07E	

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.

_____ Seal
Notary Public

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

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

M. 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.

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

N. 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.

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.

Full time site supervision of staff, subcontractors, and suppliers must be supplied for the duration of this project. A competent superintendent shall be in attendance at the job site at all times when work is being performed. A qualified site superintendent must have the authority to represent and make decisions for his or her company with regards to the subject job, must be able to give guidance and direction to employees, subcontractors and suppliers, and must be knowledgeable about the work to be provided. Failure to provide a qualified site superintendent at the job site or at a project meeting shall subject the Contractor to a penalty of **$500 per day** for every occurrence.

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.

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 him of the situation, affording him 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 he will be required to clean up and prepare the business section for the usual activities on these evenings. The Contractor and his 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 he 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, 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/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

The Contractor shall cause to be taken by an experienced professional photographer a series of un-retouched photographs and a DVD video illustrating the pre-construction site conditions and the final conditions of the project site.

Pre-construction photographs shall be taken at a minimum of each five hundred (500) linear feet along the path of any construction work and adjacent property to work site(s) in order to provide a complete record of pre-construction conditions. Upon completion of final clean up and pavement/site restoration, “as-built” conditions shall be recorded by the taking of photographs at the same locations. Additional photographs of both pre-construction and post-construction conditions shall be taken if directed by the Engineer.

Two copies of the DVD or two sets of glossy prints, 8" x 10" size mounted on cloth with a wide flap for binding (8" x 11" overall), and properly identified with an adequate description on the back of each photograph, shall be furnished to the Engineer with the Contractor’s monthly payment estimate. Damaged, out of focus or inadequately identified photos shall be replaced at the Contractor’s expense. As a minimum, the DVD and/or photograph descriptions shall contain the following information:

a) Name and address of photographer and date taken.

b) Location and orientation of photograph.

c) Project name and contract number.

d) Names and home official addresses of Village, Contractor, and Engineer.

Payment - Payment for photographs and/or DVD's is a non-direct pay item and the cost is considered included in the various contract prices bid.

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.

SUBSTANTIAL COMPLETION RELEASE

SUBSTANTIAL COMPLETION RELEASE FORMS

SUBSTANTIAL COMPLETION RELEASE

This release, dated _____, 20____, is given

BY: The Releasor(s)

_____ ("Contractor")

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

THA Architecture & Engineering P.C. and Calgi Construction Company, Inc.

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 #: DPW-25-07__
   Contract Description: Multi-Modal Transportation Hub _____Construction

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

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

FINAL COMPLETION RELEASE

FINAL COMPLETION RELEASE FORMS

This release, dated _____, 20____, is given

BY: The Releasor(s)

_____ ("Contractor")

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

THA Architecture & Engineering, P.C. and Calgi Construction Company, Inc.

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 #: DPW-25-07__
   Contract Description: Multi-Modal Transportation Hub _____ Construction

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.

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# 2025003396.

· Wage Schedule · Submit Notice Of Award · Submit Notice Of Project Completion

PRC#: 2025003396 **Acceptance Status:** Accepted Article 8
Type of Contracting Agency: Village

Contracting Agency

Village of Ossining
Paul Fraioli
Village Engineer
101 Route 9A
PO Box 1166
Ossining NY 10562

(914) 682-9423
pfraioli@villageofossining.org

Send Reply To

Project Information

Project Title	Multi Modal Transportation Hub
Description of Work	Parking Garage Transportation Hub
Contract Id No.	
Project Locations(s)	Village of Ossining
Route No / Street Address	Brandreth Street, Parking Lot
Village / City	Ossining
Town	
State / Zip	NY 10562
Nature of Project	New Building
Approximate Bid Date	04/01/2025
Checked Occupation(s)	Construction (Building, Heavy & Highway, Sewer, Water, Tunnel)

Applicable Counties

Westchester

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.

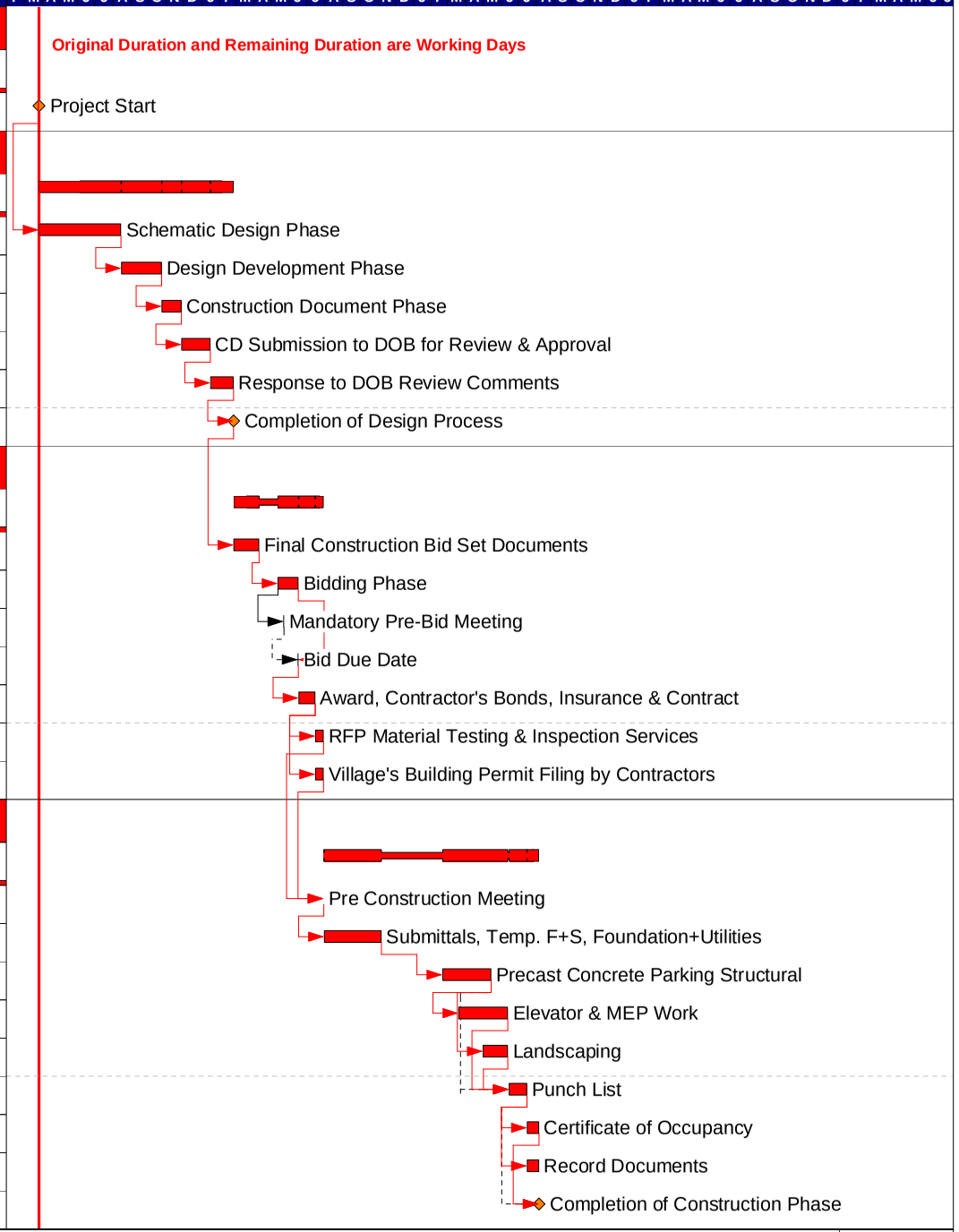
1. May 12, 2025-Release of Specifications and Drawings
2. May 22, 2025 - Pre-Bid Meeting
3. June 16, 2025- Bid Due Date
4. July 30, 2025 - Construction Start
5. August 5, 2026 – Construction Completion

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTIONS (Not Used)

END OF SECTION

Act ID	Description	Orig Dur	Rem Dur	Early Start	Early Finish
Start					
		0	0	26MAR24	26MAR24
1000	Project Start	0	0	26MAR24	
Design Process Phase					
		236d	236d	26MAR24	24FEB25
1010	Schematic Design Phase	101d	101d	26MAR24	14AUG24
1020	Design Development Phase	50d	50d	15AUG24	23OCT24
1030	Construction Document Phase	24d	24d	24OCT24	26NOV24
1040	CD Submission to DOB for Review & Approval	34d	34d	27NOV24	15JAN25
1045	Response to DOB Review Comments	27d	27d	16JAN25	24FEB25
1050	Completion of Design Process	0	0		24FEB25
Bidding and Award Construction Contract					
		109d	109d	25FEB25	29JUL25
1060	Final Construction Bid Set Documents	32d	32d	25FEB25	09APR25
1070	Bidding Phase	25d	25d	12MAY25	16JUN25
1075	Mandatory Pre-Bid Meeting	1d	1d	22MAY25	22MAY25
1077	Bid Due Date	1d	1d	16JUN25	16JUN25
1080	Award, Contractor's Bonds, Insurance & Contract	20d	20d	17JUN25	15JUL25
1085	RFP Material Testing & Inspection Services	10d	10d	16JUL25	29JUL25
1090	Village's Building Permit Filing by Contractors	10d	10d	16JUL25	29JUL25
Construction Phase					
		258d	258d	30JUL25	05AUG26
1100	Pre Construction Meeting	1d	1d	30JUL25	30JUL25
1110	Submittals, Temp. F+S, Foundation+Utilities	70d	70d	31JUL25	06NOV25
1120	Precast Concrete Parking Structural	60d	60d	20FEB26	14MAY26
1130	Elevator & MEP Work	60d	60d	20MAR26	12JUN26
1140	Landscaping	30d	30d	01MAY26	12JUN26
1150	Punch List	22d	22d	15JUN26	15JUL26
1160	Certificate of Occupancy	15d	15d	16JUL26	05AUG26
1170	Record Documents	15d	15d	16JUL26	05AUG26
1180	Completion of Construction Phase	0	0		05AUG26



Start date	26MAR24
Finish date	05AUG26
Data date	26MAR24
Run date	30APR25
Page number	1A

Village of Ossining
Multi-Modal Transportation Hub

Early bar
Progress bar
Critical bar
Summary bar
Start milestone point
Finish milestone point

Section 01 10 00
Construction Implementation Plan

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 the Construction Implementation Plan (CIP-1) attached with notes:.
   a. Work Hours 8am-6pm
   b. Noise Ordinance 8am-6pm unless otherwise noted.
   c. Dumpsters TBD
   d. Construction Signage as required
   e. Temporary Fencing Layout to be confirmed with Owner PRIOR to installation
   f. Submit WORKZONE TRAFFIC CONTROL PLAN for all work related to WATER MAIN REPLACEMENT on Brandreth Street and Leonard Place showing Steel Plates, Barricades, Fencing and Signage; Flagmen to be included as required.
   g. WATER MAIN REPLACEMENT TO TAKE PRECEDENCE OVER ALL OTHER WORK

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTIONS (Not Used)

END OF SECTION

SECTION 01 10 00
SUMMARY

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 the following:

1. Work covered by the Contract Documents.
2. Type of the Contract.
3. Work phases.
4. Work under other contracts.
5. Products ordered in advance.
6. Use of premises.
7. Owner's occupancy requirements.
8. Work restrictions.
9. Specification formats and conventions.

B. Related Sections include the following:

1. Division 1 Section “Construction Implementation Plan”

2. Division 1 Section “Summary of Multiple Primes”

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

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: PCNY2303.00 Ossining Multi-Modal Transportation Hub

1. Project Location: Brandreth St. surface parking lot at Brandreth St. and Leonard St., Ossining, New York, 10562.

B. Owner: The Village of Ossining, 16 Croton Avenue, Ossining, NY 10562

C. Architect: THA Architects & Egineering, PC
144 Livingston Avenue, New Brunswick, New Jersey 08901

D. Construction Manage as subconsultant to the Architect: Calgi Construction Company, Inc.
56 Lafayette Ave, Ste 350, White Plains, NY 10603

1. Construction Manager has been engaged for this Project to serve as an advisor to the architect and to provide assistance in administering the Contract for Construction between Owner and each Prime Contractor..
2. Construction Manager for this Project is Project's Coordinator. In Divisions 1 through 16 Sections, the terms "Construction Manager" and "Coordinator" are synonymous.

E. The Work consists of the following:

1. The Work includes but not limited to:
   a. Site demolition including trees and utilities relocation.
   b. New site work including: grading / drainage, landscaping including plaza with pavement, trees and plants, site lighting, site furniture..
   c. 242 space, precast open parking garage. One ground with three supported levels.
   d. Select area of exterior façade treatment.
   e. Twelve EV spaces with infrastructure for future EV’s.
   f. Interior and Exterior building lighting.
   g. Security cameras.
   h. E-Bike Share Shelter with enclosed repair shop, toilet room and storage.
   i. Outdoor / covered E-Bike charging stations, E-Bike battery charging lockers, and standard bike racks.

1.4 TYPE OF CONTRACT

A. Project will be constructed under a multiple prime contract per NYS WICKS Law.

1.5 USE OF PREMISES

A. General: Contractor shall have full use of premises for construction operations, including use of Project site, during construction period.Contractor's use of premises is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

B. See Construction Implementation Plan Spec Section 01 10 00

1.6 OWNER'S OCCUPANCY REQUIREMENTS

1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Owner occupancy.
2. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy.
3. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On

occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of building.

4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building.

1.7 WORK RESTRICTIONS

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.

A. On-Site Work Hours: Work shall be generally performed inside the existing building during normal business working hours of **8:00**a.m. to 6:00 p.m., Monday through Friday, except otherwise indicated or as Owners requirements.

1. Weekend Hours: per the Owners requirements
2. Early Morning Hours: per the Owners requirements and by authorities having jurisdiction for restrictions on noisy work.
3. Hours for Utility Shutdowns: per the Owners requirements
4. Hours for noisy activity: per the Owners requirements and authority having jurisdiction

B. Existing Utility Interruptions: 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 Construction Manager not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Construction Manager's written permission.

1.8 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 16-division format and CSI/CSC's "MasterFormat" numbering system.

1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
2. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.

1.9 MISCELLANEOUS PROVISIONS

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

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: Full-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.
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 Backfill of Trenches for the Work of each contract shall be provided by each contract for its own Work to 5"-0" outside the building footprint. Electrical Contract. to provide excavation and backfill of their trenches beyond the 5'- O'' If line.
4. Cutting and Patching: Provided by each contract for its own Work.
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 fourteen (14) working days after the coordinated construction schedule has been received from Project Coordinator, review and submit any and all comments, amendments to, and/or acceptance of said schedule. Project Coordinator 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 usually considered as its own normal construction activity, and 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:

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 "G," “C," “L”, “A”, “AB”, “S”, and "SB" and includes any and all interfacing work shown elsewhere on the remaining Contract Drawings: “P,” “M,” “E,” “E,”, “MB”, “FA” and “FP.”.
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 & Fire Suppression Contract, Mechanical Contract and Electrical Contract for functional and spatial relationships of components of architectural, structural, civil, 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.
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
6. All Slabs-on-grade and Stairs-on-grade outside of building footp rint, 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 fire suppression, plumbing, mechanical and electrical work from a starting point designated as per the Civil Drawings. (Starting point needed on the C- 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 Genera 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 and supplies, including weekly janitorial services.
3. Trenching for all utilities, except electrical, by General Contractor up to 5'-0" outside of building perimeter.
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 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. Until permanent stairs are available, provide temporary stairs where ladders are not adequate, including to roofs.
19. Dewatering facilities and drains, unless required solely for the Work of another contract.
20. Excavation support and protection, unless required solely for the Work of another Contract.
21. Pest control. Provide pest control inspection at project closeout as indicated in Division 1 Section " Execution and Closeout Requirements."
22. General waste disposal facilities.
23. Temporary fire-protection equipment.
24. Environmental protection.

1.8 PLUMBING and FIRE SUPPRESSION CONTRACT

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

1. Work is outlined on Drawings with the Sheet Identifier "P" , “FA”, and "FP", and includes any and all interfacing work shown elsewhere on the remaining Contract Drawings: “G," “C,” "L" “A,” “AB,” “S”, “SB”, “M”, “MB”, and “E”.

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 Site Contract, General Construction Contract, Plumbing and Fire Suppression Contract, Electrical 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, including RPZ and DCDA
5. Domestic water distribution.
6. Sanitary waste.
7. Stormwater drainage to 5'-0" outside building perimeter.
8. Plumbing connections to equipment furnished by the General Construction Contract, Mechanical Contract and Electrical 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, backflow-prevention devices.
2. Plumbing connections to proposed systems and temporary facilities and controls furnished by the General Construction Contract, Mechanical Contract and Electrical 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," and”MB” includes any and all interfacing work shown elsewhere on the remaining Contract Drawings: "G," “C," “L,” "A" “AB,” “S,” “SB”,”P”, “E” “FA” and “FP”
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 and Fire Suppression Contract, Electrical Contract, for functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
c. Indicate required installation sequences if necessary.

7. Mechanical connections to equipment furnished by the General Construction Contract, Plumbing and Fire Suppression Contract and Electrical 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,", "C" and "L" and includes any and all interfacing work shown elsewhere on the remaining Contract Drawings: : "G,", "A" "AB," "S," "SB","P", "M', "MB" and "FP"

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 and Fire Suppression Contract, Mechanical Contract and Electrical Contract, for functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
b. Indicate required installation sequences if necessary.

3. Site electrical distribution.
4. Site lighting.
5. Electrical service and distribution.
6. Exterior and interior lighting.
7. Special electrical systems, including the following:

a. Uninterruptible power supply systems.
b. Battery power systems.
c. Fire alarm system.
d. Grounding

8. Electrical connections to equipment furnished by the General Construction Contract, Fire Suppression Contract, Plumbing Contract and Mechanical 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 of single phase 400 amp to a distribution panel within Construction Site area as well as area of Field Office(s), not more that 100 ft. in from property line.
2. Electric power service and distribution.
3. Lighting, including site lighting.
4. Provide temporary telephone service, electronic communication service, including internet service, and electric power for the Construction Manager field office.

a. Electrical connections to proposed systems and temporary facilities and controls
    i. furnished by the General Construction Contract, Fire Suppression Contract, Plumbing Contract and Mechanical Contract.

PART 2 ·PRODUCTS (Not Used)

PART 3 ·EXECUTION (Not Used)

END OF SECTION 01125

SECTION 01 25 00
CONTRACT MODIFICATIONS

PART 1 GENERAL

1.1 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 specifies administrative and procedural requirements for handling and processing Contract modifications.

B. Related Sections include the following:
1. Division 1 Section “Unit Prices” for administrative requirements for using unit prices.
2. Division 1 Section “Product Requirements” for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue through Construction Manager supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, “Architect’s Supplemental Instructions.”

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect or Construction Manager 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. Proposal Requests issued by Architect or Construction Manager are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
2. Within 3-days 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 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 unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Construction Manager.

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 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 Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

C. Proposal Request Form: Use AIA Document G709 for Proposal Requests or similar acceptable form.

1.5 ALLOWANCES **N/A**

A. Allowance Adjustment: To adjust allowance amounts, base each Change Order proposal on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the allowance.
2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the Purchase Order amount or Contractor's handling, labor, installation, overhead, and profit. Submit claims within 14 days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. Owner will reject claims submitted later than 21 days after such authorization.

1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

1.6 CHANGE ORDER PROCEDURES

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

1.7 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on EJCDC Document 1910-8-F or in similar format. 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 01 27 00

UNIT PRICES

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 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 Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2-PRODUCTS (Not Used)

PART 3- EXECUTION

3.1 LIST OF UNIT PRICES

A. CONTRACT No. 1 – General Construction Contract

1. Trench Rock Excavation
   a. Per cubic yard of Trench rock excavation according to Division 31 Section "Earthwork". Include replacement with approved materials.
   b. Volume of rock actually removed, measured in original position, but not to exceed the following:
      1) 24 inches outside of concrete forms
      2) 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide

2. Bulk Rock Excavation
   a. Per cubic yard of bulk rock excavation according to Division 31 Section "Earthwork". Include replacement with approved materials.
   b. Volume of rock actually removed, measured in original position, but not to exceed the following:
      1) 24 inches outside of concrete forms other than at footings
      2) 12 inches outside of concrete forms at footings
      3) 6 inches outside of minimum required dimensions of concrete cast against grade
      4) Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments
      5) 6 inches beneath bottom of concrete slabs-on-grade

3. Exterior Bulk Excavation
   a. Per cubic yard of Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect, according to Division 31 Section "Earthwork". Include work outside the perimeter of the building structure.
   b. Volume of material actually removed, measured in original position.

4. Exterior Trench and Culvert Excavation
   a. Per cubic yard of Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect, according to Division 31 Section "Earthwork". Include the excavation for and backfill of all culverts, pipe lines, and other minor structures outside the perimeter of the building structure, including but not limited to leaching basins, catch basins, field inlets, manholes and drop inlets.
   b. Volume of material actually removed, measured in original position, but not to exceed the following as applicable:
      1) Bottom Limits: The elevation of the bottom payment line shall be the invert elevation of the pipe, conduit, or culvert. For pipes, conduits, or culverts of nominal horizontal dimensions of 12 in. to 144 in., the width of the excavations at the bottom payment line shall be the nominal inside horizontal dimension of

the pipe, conduit, or culvert plus 48 in., or three times the nominal inside horizontal dimension, whichever is less.

2) Side Limits: The side payment lines of the excavation shall be vertical to the bottom of payment line, regardless of whether sheeting is or is not required or used. For utility lines, exclusive of conduit and cable lines, of less than 12 in. diameter, the excavation width shall be the actual bottom width necessary, as determined by the Construction Manager, to perform the installation work required, or 40 in., whichever is less.

5. Replacement of Unsuitable On-Site Material
   a. Per cubic yard of unsuitable on-site material removed according to Division 31 Section "Earthwork". Include replacement with approved materials.
   b. Volume of unsuitable material actually removed, measured in original position.

6. Utilities Excavation
   a. Per linear foot of excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect, according to Division 31 Section "Earthwork". Include the excavation and necessary backfill required for utility piping and conduits.
   b. Length of utility actually put in place. Include the cost of furnishing all labor, materials and equipment necessary to excavate and backfill the trench and to replace any pavement, shoulder, and sidewalk courses, sub-courses, curbs, drives, lawns and other top surfaces as required to complete the work.

7. Cast-In-Place Concrete
   a. Per cubic yard of concrete beyond indicated lines and dimensions as directed by Architect, according to Division 3 Section "Cast-in-Place Concrete". Include work inside the perimeter of the building structure.
   b. Volume of material actually installed, measured in original position.

8. Concrete Slab-On-Grade
   a. Per square foot of concrete beyond indicated lines and dimensions as directed by Architect, according to Division 3 Section "Cast-in-Place Concrete".
   b. Volume of material actually installed, measured in original position.

9. Structural Steel
   a. Per ton of steel beyond indicated lines and dimensions as directed by Architect, according to Division 5 Section "Structural Steel".
   b. Volume of material actually installed, measured in original position.

10. Building Façade Art Scrim – Graphic Tensile Membrane
    a. Per square foot of graphic tensile membrane including materials and installation according to Division 13 Section "Tensile Membrane Structure".

B. CONTRACT No. 2 – Plumbing and Fire Suppression Construction Contract

1. Fixtures
   a. Per each type listed below. Include vacuum breakers, drains, traps, etc as per specifications:
      1) Water Closet
      2) Urinal

3) Lavatory
4) Drinking Fountain
5) Mop Sink Basin
6) Floor Drain
7) Hose Bibb

2. Backflow Prevention
   a. RPZ assembly, 1" and 2"

3. Sprinkler Head
   a. Per head of each type specified according to applicable Division 21 Sections:
      1) Pendant Exposed
      2) Upright
      3) Sidewall

4. Tamper Switch
   a. Include coordination for FA connection

5. Flow Switch
   a. Include coordination for FA connection

C. CONTRACT No. 3 – Mechanical Construction Contract

1. Ductwork
   a. Per each listed below to include Duct Fittings and transitions, Duct Insulation and Duct internal Soundlining as required:
      1) Galvanized Ductwork (square, round, etc), in $/pound
      2) Volume dampers

2. Equipment
   a. Unit heaters

3. Controls
   a. BMS Control integration and programming for all listed below:
      1) Motorized Dampers

4. General
   a. Diffusers, Grilles

D. CONTRACT No. 4 – Electrical Construction Contract

1. Duplex Receptacle
    a. Per receptacle with wiring to nearest available receptacle circuit, back box, wires terminated and cover plate according to applicable Division 26 Sections.

2. Lighting Switch
    a. Per switch of each type listed below, with back box, wires terminated and cover plate according to applicable Division 26 Sections:
        1) Line voltage lighting switch
        2) Low voltage lighting switch

3. Vacancy Sensor
    a. Per sensor with back box, wires terminated and cover plate according to applicable Division 26 Sections.

4. Lighting Fixtures
    a. Per lighting fixture of each type according to applicable Division 26 Sections.

5. Empty Conduit and Junction Box for Telecommunications System
    a. Per box with conduit and fish string to above ceiling assembly according to applicable Division 26 Sections.

6. Fire Life Safety Devices
    a. Per device of each type listed below with programming according to applicable Division 26 Sections:
        1) Smoke Detector
        2) Pull Station
        3) Tamper Switch
        4) Horn / Strobe
        5) Heat Detector
        6) Fire Alarm Control Module

7. Branch Circuits
    a. Per 20 linear foot of each type listed below terminated at both ends:
        1) 2#12,1#12G-¾" C
        2) 2#10,1#10G-¾" C
        3) 4#10,1#10G-¾" C
        4) 5#10,1#10G-¾" C

8. Feeders
    a. Per linear foot of each type listed below terminated at both ends:
        1) 4#4,1#8G-1 ¼ " C
        2) 3#2,1#6G-2" C
        3) 4#4/0,1#2G-2.5"C
        4) 4#500mcm,1#350mcmG-3½" C

9. Circuit Breakers
    a. Per each type listed below:
        1) 20A-1p breaker
        2) 30A—1p breaker
        3) 20A-2p breaker

4) 30A-2p breaker
5) 60A-3p breaker
6) 80A -3p breaker
7) 100A-3p breaker
8) 150A-3p breaker
9) 225A /3p breaker

10. Fire Alarm Branch Wiring
    a. Per linear foot, in conduit.

11. Fused Disconnect Switches
    a. Per each type listed below:
        1) 30 A-3p Fused Disconnect switch
        2) 60 A-3p Fused Disconnect switch
        3) 100 A-3p Fused Disconnect switch
        4) 200 A-3p Fused Disconnect switch
        5) 300 A-3p Fused Disconnect switch

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 012500 "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

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%
7. Provide Labor & Material broken out separately for each item

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 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

A. Section 011000 -Summary
B. Section 011250-Summary of Multiple Primes
C. Section 013216 -Construction Progress Schedule: Form, content, and administration of schedules.
D. Sections 017000 -Section 019000 Execution and Closeout Requirements: Additional coordination requirements including Closeout Submittals and Project record documents.

1.03 PROJECT COORDINATION

A. Project Coordinator: Clerk of the Works.
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. Architect 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 to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.03 SITE MOBILIZATION MEETING

A. Construction Manager 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.

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. Schedule and administer meetings throughout progress of the Work at weekly intervals.
B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
C. 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.
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. 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.

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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.

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 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.
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 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

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SECTION 01 31 00
PROJECT COORDINATION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the project coordination as specified herein, including, but not limited to, the following:
   1. General project coordination procedures.
   2. Conservation.
   3. Coordination drawings.
   4. Administrative and supervisory personnel.
   5. Cleaning and protection.

1.3 RELATED SECTIONS

A. Project Meetings - Section 01 31 19.
B. Submittal Procedures - Section 01 33 00.
C. Product Requirements - Section 01 55 00.
D. Closeout Procedures - Section 01 77 00.

1.4 COORDINATION

A. Coordinate construction operations included in various sections of these specifications to ensure efficient and orderly installation of each part of the work. Coordinate construction operations included under different sections that depend on each other for proper installation, connection, and operation.
   1. Schedule construction operations in the sequence required to obtain the best results where installation of one part of the work depends on installation of other components, before or after its own installation.
   2. Coordinate installation of different components to ensure maximum accessibility for required maintenance, service, and repair.
   3. Make provisions to accommodate items scheduled for later installation.

B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.
   1. Prepare similar memoranda for the Owner and separate contractors where coordination of their work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the work. Such administrative activities include, but are not limited to, the following:
   1. Preparation of schedules.
   2. Installation and removal of temporary facilities.
   3. Delivery and processing of submittals.
   4. Progress meetings.
   5. Project closeout activities.

D. Conservation: Coordinate construction operations to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
    1. Salvage materials and equipment involved in performance of, but not actually incorporated in, the work.

1.5 SUBMITTALS

A. Coordination Drawings: Prepare coordination drawings where careful coordination is needed for installation of products and materials fabricated by separate entities. Prepare coordination drawings where limited space availability necessitates maximum utilization of space for efficient installation of different components.
    1. Show the relationship of components shown on separate shop drawings.
    2. Indicate required installation sequences.
    3. Comply with requirements contained in Section 013300, "Submittal Procedures."

B. Staff Names: Within 15 days of commencement of construction operations, submit a list of the contractor's principal staff assignments, including the superintendent and other personnel in attendance at the project site. Identify individuals and their duties and responsibilities. List their addresses and telephone numbers.
    1. Post copies of the list in the project meeting room, the temporary field office, and each temporary telephone.

PART 2 PRODUCTS

(Not Applicable)

PART 3 EXECUTION

3.1 GENERAL COORDINATION PROVISIONS

A. Inspection of Conditions: Require the installer of each major component to inspect both the substrate and conditions under which work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in a manner acceptable to the Architect.
B. Coordinate temporary enclosures with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.

3.2 CLEANING AND PROTECTION

A. Clean and protect construction in progress and adjoining materials in place, during handling and installation. Apply protective covering where required to assure protection from damage or deterioration at substantial completion.
B. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to assure operability without damaging effects.
C. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:

    1. Excessive static or dynamic loading.
    2. Excessive internal or external pressures.

3. Excessively high or low temperatures.
4. Thermal shock.
5. Excessively high or low humidity.
6. Air contamination or pollution.
7. Water or ice.
8. Solvents.
9. Chemicals.
10. Light.
11. Radiation.
12. Puncture.
13. Abrasion.
14. Heavy traffic.
15. Soiling, staining, and corrosion.
16. Bacteria.
17. Rodent and insect infestation.
18. Combustion.
19. Electrical current.
20. High-speed operation.
21. Improper lubrication.
22. Unusual wear or other misuse.
23. Contact between incompatible materials.
24. Destructive testing.
25. Misalignment.
26. Excessive weathering.
27. Unprotected storage.
28. Improper shipping or handling.
29. Theft.
30. Vandalism.

END OF SECTION 01 31 00

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 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. Utilitize 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.

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.

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 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, an 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.

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.

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 01 40 00
QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

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

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.

2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.

3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.

1.3 DEFINITIONS

A. 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.

B. 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. Services do not include contract enforcement activities performed by Architect or Construction Manager.

C. **Mockups**: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, 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.

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

E. 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, and similar operations.

F. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five (5) 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.

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision 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 SUBMITTALS

A. Informational Submittals:

1. 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.
2. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

    a. Specification Section number and title.
    b. Entity responsible for performing tests and inspections.
    c. Description of test and inspection.
    d. Identification of applicable standards.
    e. Identification of test and inspection methods.
    f. Number of tests and inspections required.
    g. Time schedule or time span for tests and inspections.

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, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.

9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

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

1.7 QUALITY ASSURANCE

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

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

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, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

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

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

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

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

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

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

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect or Construction Manager.
2. Notify Architect and Construction Manager seven (7) 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 and Construction Manager's approval of mockups before starting work, fabrication, or construction.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups 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 inspecting they are engaged to perform.

2. Costs for cancelled, retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

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

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

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

3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.

4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.

5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. 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 Division 01 Section "Submittal Procedures."

D. 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.

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

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

1. Notify Architect, Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. Determine the location 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 any duties of Contractor.

G. Associated Services: Cooperate with agencies 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 inspecting. 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 inspecting equipment at Project site.

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

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

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

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

1.9 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in Statement of Special Inspections attached to this Section, and as follows:

1. Notifying Architect, Construction Manager, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
2. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect, through Construction Manager, with copy to Contractor and to authorities having jurisdiction.

3. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.

4. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.

5. Retesting and re-inspecting 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 Construction Manager’s, reference during normal working hours.

3.2 REPAIR AND PROTECTION

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

1. Provide materials and comply with installation requirements specified in other 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 Division 01 Section "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 01 40 00

SECTION 01 42 00

REFERENCES

PART 1 - GENERAL

1.01 SUMMARY

A. Abbreviations and Acronyms.

B. Definitions

C. Reference Standards.

1.02 ABBREVIATIONS AND ACRONYMS

A. The following list of common abbreviations are referenced in individual specification sections. This list is provided for convenience to the Contractor and is not intended to define all abbreviations which may be found in the Contract Documents.

B. Abbreviations for contract and specifications.

EPA	United States Environmental Protection Agency
HVAC	Heating, ventilating, and air conditioning
IAQ	Indoor Air Quality
IEQ	Indoor Environmental Quality
MSDS	Material Safety Data Sheet
NIC	Not in Contract
OFCI	Owner Furnished, Contractor Installed
OFI or OFOI	Owner Furnished and Installed (Owner Furnished, Owner Installed)
OPM	Owner's Project Manager (as defined in Section 01 10 00)
VOC	Volatile Organic Compounds

C. Abbreviations for measurements and quantities.

C	Celsius
cm	Centimeter
F	Fahrenheit
Hrs	Hours
Kg	Kilogram
L	Liter
M	meter
m^2 or SM	square meter
m^3 or CM	cubic meter
mm	Millimeter
Mths	Months
psi	Pounds per square inch
t	ton

1.03 DEFINITIONS

A. Definitions of contracting parties (Owner, Owner's Project Manager, Construction Manager, and Architect): Refer to Section 01 10 00 – PROJECT SUMMARY.

B. Definitions for terms utilized in the Contract Documents:

C. "As necessary," "as directed," "when directed," "satisfactory," "good and sufficient," "approved," or other general qualifying terms are used on the Drawings: These terms are deemed to be implicitly followed by the words, "in the opinion of the Architect," or "by the Architect," as the case may be."

D. "Addenda": written or graphic instruments issued prior to the execution of the Contract which modify or interpret the Bidding Documents, including the Drawings and Specifications, by additions, deletions, clarifications or corrections.

E. "Approval," "approved, "approved equal," "or equal," or "other approved" means "as approved by the Architect."

F. The terms "Contractor", "General Contractor"as used in the Project Manual have the same meaning and are interchangeable in Contract Documents. These terms refer to the same entity.

G. The term "Day": is defined as the following:

1. The term "calendar day" is a full 24 hour period, starting from 12 AM (midnight), and including all weekends and legal holidays.
2. The term "working day" shall mean any calendar day except Saturdays, Sundays, and legal holidays at the place of the building.
3. Where the term "day" is used without the adjective of "calendar" or "working", it shall mean "calendar day".

H. The terms "Designer", "Architect", "Engineer" and "Architect/Engineer" as used in the Project Manual have the same meaning and are interchangeable in Contract Documents. These terms refer to the same entity.

I. "Furnish and Install" or "Provide": items identified shall be furnished and installed under this Contract. The term "Furnish", when used separately, shall mean that the items referred to shall be furnished, only. Similarly the term "install", when used separately, shall mean that the items referred to shall be installed, only.

J. "Knowledge," "recognize" and "discover," their respective derivatives and similar terms in the Contract Documents, as used in reference to the Contractor, shall be interpreted to mean that which the Contractor knows (or should know), recognizes (or should recognize) and discovers (or should discover) in exercising the care, skill and diligence required by the Contract Documents. Analogously, the expression "reasonably inferable" and similar terms in the Contract Documents shall be interpreted to mean reasonably inferable by a Contractor familiar with the Project and

exercising the care, skill and diligence required of the contractor by the Contract Documents.

K. "Not in Contract" or "N.I.C.": equipment, furnishings, or other materials not included as a part of this Contract.

L. "Product": materials, systems and equipment.

1.04 REFERENCE STANDARDS

A. For products or workmanship specified by association, trade, or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by DATE OF ISSUE for Contract Documents, current on the effective date of the Owner-Contractor Agreement.

C. Should specified reference standards conflict with Contract Documents, the Contractor shall request clarification from Architect before proceeding.

D. The contractual relationship to the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

E. Schedule of References

1. Listed below are abbreviations for the names and titles of trade association names, federal government agencies and similar organizations which are referenced in the individual specification sections. The addresses and URL's (Uniform Resource Locators) provided are for the Contractor's convenience and are believed to be current and accurate, however addresses and URL's frequently change, and no assurance is made on their accuracy:

AA	Aluminum Association 900 19th Street N.W., Suite 300 Washington, DC 20006 www.aluminum.com
ABAA	Air Barrier Association of America 1600 Boston-Providence Highway Walpole, MA 02081 www.airbarrier.org
AAMA	American Architectural Manufacturer's Association 1827 Walden Office Sq., Suite 104 Schaumburg, IL 60173-4268 www.aamanet.org
ACI	American Concrete Institute, International 38800 Country Club Drive, Farmington Hills, Michigan 48331 www.aci-int.org
ACPA	American Concrete Pipe Association 222 West Las Colinas Boulevard, Suite 641, Irving TX www.concrete-pipe.org
ADC	Air Diffusion Council 104 S. Michigan Ave, Suite 1500, Chicago, IL 60603 www.flexibleduct.org

AFPA	American Forest & Paper Association (Formerly NFPA National Forest Products Association) 1111 19th St. N.W., Suite 800, Washington, DC 20036 www.afandpa.org
AGA	American Gas Association Inc. 1515 Wilson Blvd. Arlington, VA 22209-2469 www.agagas.com
AGAI	American Galvanizers Association Inc. 12200 E.Lliff Ave, Suite 204, Aurora, CO 80014-1252 www.galvanizeit.org
AIA	American Institute of Architects 1735 New York Avenue, N.W., Washington, DC 20006-5292 www.aia.org
AIHA	American Industrial Hygiene Association 2700 Prosperity Ave, Suite 250, Fairfax VA 22031 www.aiha.org
AISC	American Institute of Steel Construction 1 E. Wacher Dr., Suite 3100, Chicago,IL 60601-2001 www.aisc.org
AMCA	Air Movement and Control Association 30 W. University Drive, Arlington Heights, IL 60004-1893 www.amca.org
ANSI	American National Standards Institute 11 W. 42nd Street, 13 Floor, New York, NY 10036 www.ansi.org
APA	APA - The Engineered Wood Association (formerly APA - American Plywood Association) P.O. Box 11700, Tacoma, WA 98411-0070 www.apawood.org
ARI	Air-Conditioning and Refrigeration Institute 4301 N. Fairfax Dr., Suite 425, Arlington, VA 22203 www.ari.org
ASCA	Architectural Spray Coaters Association 230 West Wells Street, Suite 311, Milwaukee WI 53203 www.aecinfo.com
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers 1791 Tullie Circle NE, Atlanta GA.30329 www.ashrae.org
ASME	American Society of Mechanical Engineers 345 East 47th Street, New York, NY 10017-2392 www.asme.org
ASTM	American Society for Testing and Materials 100 Barr Harbor Drive, West Conshohocken, PA 19428 www.astm,.org
AWPA	American Wood Preservers' Association P.O. Box 286, Woodstock, MD 21163-0286 www.awpa.com
AWPI	American Wood Preservers' Institution 1945 Old Gallows Rd., Suite 150, Vienna, VA 22182 www.oas.org
AWS	American Welding Society 550 LeJeune Road, N.W., Miami, FL 33126 www.aws.org

BHMA	Builders Hardware Manufacturers Association, Inc. 355 Lexington Ave., 17 Floor New York, NY 10017 www.buildershardware.com
BIA	Brick Industry Association 11490 Commerce Park Drive, Reston, VA 22091-1525 www.bia.org
CISCA	Ceilings & Interior Systems Construction Association 579 W. North Ave., Suite 301, Elmhurst, IL 60126 www.cisca.org
CRI	Carpet and Rug Institute 310 Holiday Ave, Dalton, GA 30720 ww.carpet-rug.com
CRSI	Concrete Reinforcing Steel Institute 933 N. Plum Grove Road, Schaumburg, IL 60173-4758 www.crsi.org
CTIOA	Ceramic Tile Institute of America 12061 W.Jefferson BLVD, Culver City, CA 90230-6219 www.ctioa.org
DHI	Door and Hardware Institute 14170 Newbrook Dr., Chantilly, VA 22021-2223 www.dhi.org
FM	Factory Mutual Engineering & Research Corp. 1151 Boston-Providence Turnpike Norwood, MA 02062 www.fmglobal.com
GA	Gypsum Association 6525 Belcrest Road, Suite 480, Hyattsville, MD 20782 www.gypsum.org
GANA	Glass Association of North America 2945 S.W. Wanamaker Dr., Suite A, Topeka, KS 66612-5321 www.glass.org
GICC	Glazing Industry Code Committee 3310 Harrison St., Topeka, KS 66611-2279 www.glazingcodes.net
IGCC	Insulating Glass Certification Council 3933 US Route 11, PO Box 2040, Cortland, NY 13045 www.igcc.org
KCMA	Kitchen Cabinet Manufacturers Association 1899 Preston White Drive, Reston VA 20191 www.kcma.org
LSGA	Laminators Safety Glass Association 3310 Harrison Street, Topeka KS 66611-2279 www.glass.org
MCAA	Mason Contractors Association of America 1910 S. Highland Ave. Suite 101, Lombard, IL 60148 www.masoncontractors.org
MIL	Military Specifications and Standards Naval Publications and Forms Center 5801 Tabor Avenue, Philadelphia, PA 19120 www.milspec.com
NAAMM	National Association of Architectural Metal Manufacturers 8 South Michigan Avenue, Suite 1000, Chicago, IL 60603 www.naamm.org

NCMA	National Concrete Masonry Association 2302 Horse Pen Road, Herndon, VA 20171-3499 www.ncma.org
NEBB	National Environmental Balancing Bureau 8575 Government Circle, Gaithersburg, MD 20877-4121 www.nebb.org
NEMA	National Electrical Manufacturers' Association 1300 N. 17th St., Suite 1846, Rosslyn, VA 22209 www.nema.org
NFPA	National Fire Protection Association 1 Battery March Park, PO Box 9101, Quincy, MA 02269 www.nfpa.org
NFRC	National Fenestration Rating Council 6305 Ivy Lane, Greenbelt MD 20770 www.nfrc.org
NRCA	National Roofing Contractors Association 10255 W. Higgins Road, Suite 600, Rosemont, IL 60018-5607 www.nrca.net
PCA	Portland Cement Association 5420 Old Orchard Road, Skokie, IL 60077-1083 www.cement.org
PEI	Porcelain Enamel Institute 4004 Hillsboro Pike, Suite 224B, Nashville, TN 37215 www.porcelainenamel.com
PS	Product Standard U. S. Department of Commerce www.omg.org
SDI	Steel Deck Institute P.O. Box 25, Fox River Grove, IL 60021-0025 www.sdi.org
SEI	Structural Engineering Institute of the American Society of Civil Engineers 1801 Alexander Bell Drive Reston VA 20191 www.seinstitute.org
SGCC	Safety Glass Certification Council RMS, P.O. Box 9 Henderson Harbor, NY 13651 www.sgcc.org
SIGMA	Sealed Insulating Glass Manufacturers Association 401 N. Michigan Ave., Suite 2400, Chicago, IL 60611 www.glasschange.com
SJI	Steel Joist Institute 3127 10th Ave. N., Myrtle Beach, SC 29577 www.steeljoist.org
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association 4201 Lafayette Center Dr., Chantilly, VA 22022-1209 www.smacnapa.org
SPIB	Southern Pine Inspection Bureau 4709 Scenic Highway, Pensacola, FL 32504-9094 www.spib.org
SSMA	Steel Stud Manufacturer's Association 8 South Michigan Avenue, Chicago IL 60603 www.ssma.com

SSPC	The Society for Protective Coatings 40 24th Street, 6th Floor, Pittsburgh PA 15222-4623 www.sspc.org
SWRI	Sealant, Waterproofing & Restoration Institute 2841 Main Street, Suite 585, Kansas City, MO 64108 www.swrionline.org
TCNA	Tile Council of North America, Inc. 100 Clemson Research Blvd., Anderson, SC 29625 www.tileusa.com *(formerly TCA, Tile Council of America)*
TMS	The Masonry Society 3970 Broadway, Suite 201D, Boulder CO 80304 www.masonrysociety.org
UL	Underwriters' Laboratories, Inc. 333 Pfingston Road, Northbrook, IL 60602 www.ul.com
WDMA	Window & Door Manufacturers Association (formerly National Wood Window & Door Association, NWWDA) 205 E. Touhy Avenue, Suite G-54, Des Plaines, IL 60018 www.nwwda.org

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

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SECTION 014339 - MOCKUPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Integrated exterior mockups.
2. Room mockups.

B. Related Requirements:

1. Section 014000 "Quality Requirements" for quality assurance requirements for aesthetic and workmanship mockups specified in other Sections.

1.2 DEFINITIONS

A. Integrated Exterior Mockups: Mockups of the exterior envelope constructed off-site as freestanding temporary built elements, consisting of multiple products, assemblies, and subassemblies.

B. Preconstruction Laboratory Mockups: Integrated exterior mockups constructed at testing facility to verify performance characteristics.

C. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes; doors; windows; millwork; casework; specialties; furnishings and equipment; and lighting as indicated.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Precast plant.

1. Meet with Owner, Construction Manager, Architect, testing and inspecting agency representative, and installers of major systems whose Work is included in integrated exterior mockups.
2. Review coordination of equipment and furnishings provided by the Owner for room mockups.
3. Review locations and extent of mockups.
4. Review testing procedures to be performed on mockups.
5. Review and finalize schedule for mockups, and verify availability of materials, personnel, equipment, and facilities needed to complete mockups and maintain schedule for the Work.

1.4 ACTION SUBMITTALS

A. Shop Drawings: For integrated exterior mockups.

1. Include plans, elevations, sections, and mounting attachment and support details.
2. Indicate manufacturer and model number of individual components, subassemblies, and assemblies.
3. Include site location drawing.

B. Delegated Design Submittal: For temporary structural supports for mockups not attached to building structure, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Preconstruction Test Reports: For integrated exterior preconstruction laboratory mockups.

1.6 QUALITY ASSURANCE

A. Preconstruction Laboratory Mockup Testing Agency Qualifications: Qualified in accordance with ASTM E699 for testing indicated.

B. Testing Agency Qualifications: Qualified in accordance with ASTM E699 for testing indicated and acceptable to Owner and Architect.

C. Build mockups to do the following:

1. Verify selections made under Sample submittals.
2. Demonstrate aesthetic effects.
3. Demonstrate the qualities of products and workmanship.
4. Demonstrate acceptable coordination between components and systems.
5. Perform preconstruction testing, such as window air- and water-leakage testing.

D. Fabrication: Before fabricating or installing portions of the Work requiring mockups, build mockups for each form of construction and finish required. Use materials and installation methods as required for the Work.

1. Build mockups of size indicated.
2. Build mockups in location indicated or, if not indicated, as directed by Architect or Construction Manager.
3. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at Project.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

E. Notifications:

1. Notify Architect and Construction Manager seven days in advance of the dates and times when mockups will be constructed.
2. Notify Architect and Construction Manager 14 days in advance of the dates and times when mockups will be tested.
3. Allow seven days for initial review and each re-review of each mockup.

F. Approval: Obtain Architect's and Construction Manager's approval of mockups before starting fabrication or construction of corresponding Work.

1. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 COORDINATION

A. Coordinate schedule for construction of mockups, so construction, testing, and review of mockups do not impact Project schedule.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design support structure for free-standing mockups.

B. Structural Performance:

1. Seismic Performance: Mockups and support structure to withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.
2. Wind Loads: As indicated on Drawings.

C. Mockup Testing Performance Requirements: Perform tests using design pressures and performance criteria indicated for assemblies and products that are specified in other Sections and incorporated into integrated exterior] preconstruction laboratory mockups.

2.2 INTEGRATED EXTERIOR MOCKUPS

A. Construct integrated exterior mockups according to approved mockup Shop Drawings. Construct mockups to demonstrate constructability, coordination of trades, and sequencing of Work; and to ensure materials, components, subassemblies, assemblies, and interfaces integrate into a system complying with indicated performance and aesthetic requirements.

B. Design and construct foundation and superstructure to support free-standing integrated exterior mockups.

C. Build integrated exterior mockups using installers and construction methods that will be used in completed construction.

D. Use specified products that have been approved by Architect. Coordinate installation of materials and products specified in individual Specification Sections that include Work included in integrated exterior mockups.

1. Precast architectural concrete.
2. Masonry veneer.
3. Stone cladding.
4. Cold-formed metal framing and sheathing.
5. Air and weather barriers.
6. Thermal insulation.
7. Through-wall flashing.
8. Flashing and sheet metal trim.
9. Joint sealants.
10. Metal wall panels.
11. Aluminum-framed entrances and storefront.
12. Glazed curtain walls.
13. Aluminum windows.
14. Glazing.

E. Photographic Documentation: Document construction of integrated exterior mockups with photographs in accordance with Section 013233 "Photographic Documentation." Provide photographs showing details of interface of different materials and assemblies.

F. Provide and document modifications to construction details and interfaces between components and systems required to properly sequence the Work, or to pass performance testing requirements. Obtain Architect's approval for modifications.

G. Retain approved mockups constructed in place. Incorporate fully into the Work.

PART 3 - EXECUTION

END OF SECTION 014339

SECTION 01 45 00
QUALITY CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. General quality assurance and control of installation.

B. Site safety, worker safety and training.

C. Contractor's quality control (QC) program.

D. Source quality control.

E. Field samples and mock-ups.

F. Manufacturer's field services and reports.

G. Field quality control, Owner's right for confirmation.

1.2 RELATED REQUIREMENTS

A. Section 01 43 39 - MOCK-UPS.

B. Section 01 45 29 - TESTING LABORATORY SERVICES.

1.3 GENERAL QUALITY ASSURANCE AND CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply fully with manufacturers' instructions, including performance of each step in sequence. Notify Architect when manufacturers' instructions conflict with the provisions and requirements of the Contract Documents; obtain clarification before proceeding with the work affected by the conflict.

C. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate high standards or more precise workmanship.

D. Perform work by persons qualified to produce workmanship of specified quality.

E. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.4 SITE SAFETY, WORKER SAFETY AND TRAINING

A. General: The Contractor (and his subcontractors) shall, at all times, exercise reasonable precautions for the safety of all persons. All rules, regulations, and laws concerning safety that are in effect at the work site, and in particular, all applicable regulations of the Occupational Safety and Health Administration (OSHA) of the U.S. Government, in addition to specified requirements shall be complied with in all respects.

1. Contractor's responsibility for safety shall apply continuously twenty four (24) hours per day during the term of this Contract and is not limited to normal or extended working hours.

B. Contractor’s safety program: Prior to commencement of the Work, the Contractor shall develop and implement a Safety and Health Plan to comply with the Occupational Safety and Health Administration (OSHA) standards for the Construction Industry and all other applicable Federal, State, local laws and regulations. Contractors Safety and Health Plan, and included health and safety procedures and policies, shall be submitted to the Architect and Construction Manager within fifteen (15) Days after the date of Notice to Proceed and in no event later than commencement of the Work, whichever occurs first.

1. Perform pre planning to ensure access Is provided to Fire Department for all areas of the work site throughout the duration of the Contract. The Contractor shall provide the Fire Department site access maps, updated regularly, to reflect changes in the layout of the work site and shall notify the Fire Department when each update is made
2. Post and maintain, at prominent locations throughout the Project site, emergency telephone numbers and shall insure that all personnel on site are continuously aware of this information.
3. Ensure safe access to the Work for the Owner, Architect, Architect’s consultants, their designated representatives, and all others charged with inspection, testing and monitoring of the Work, and visitors to the site. The Contractor shall furnish site visitors with safety equipment, test equipment, safety apparel and instructions that are required to ensure their safety on site, and in the performance of their duties related to the Work of this Contract

C. All employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration (OSHA) that is at least 10 hours in duration. The OSHA training and certification course shall occur at the time each employee begins work. Furnish documentation to Owner and Architect, for each employee documenting successful completion of the OSHA safety training and certification course. Submit with the first certified payroll report.

1.5 CONTRACTOR'S QUALITY CONTROL PROGRAM

A. Procedures: Contractor and each subcontractor shall include all labor, materials, equipment, services and incidental items necessary to implement quality control procedures to the extent necessary to demonstrate and maintain compliance with the Contract Documents.

B. Quality Control Plan: Within 20 days after Notice to Proceed, the Contractor shall submit a Quality Control (QC) Plan to the Construction Manager and Architect for approval. The plan shall address the following, as a minimum:

1. The Contractor's commitment to quality and implementing and managing the QC program.
2. Identification of the Contractor's onsite QC Manager, with name, qualifications, duties and responsibilities. The QC Manager shall have the authority to direct the removal and replacement of non-conforming work. The QC Manager shall be present for all QC meetings, inspections and tests during the project.
3. Procedures for addressing and commenting QC with Contractor's staff, all subcontractors and suppliers, and Owner, Architect and Owner's representative.
4. Procedures for review of submittals and submittal status, and documentation of same.
5. Procedures for pre-installation meetings and documentation of same.
6. Procedures for inspections of deliveries and documentation of same.
7. Procedures for benchmark inspections, defined as initial installations, and documentation of same.
8. Procedures for mockup inspections and documentation of same.
9. Procedures for equipment in place, inspections and documentation of same.
10. Procedures for inspections prior to closures of concealment and documentation of same.
11. Procedures for start-up and commissioning and documentation of same.
12. Procedures for turnover and documentation of same.
13. Procedures for identifying, recording, tracking correcting and reporting items requiring rework, using a Rolling Completion list chronological item number, phase area, date listed, description, party responsible for correction, date notified, and date corrected.
14. Procedures for testing and documentation of same.
15. Procedures for corrective action on Architect's Field Reports and Testing Agency reports and documentation of same.

C. Procedures for reporting on all of the above on a monthly basis as a condition precedent to review of the Contractor's application for payment.

1.6 SOURCE QUALITY CONTROL

A. 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.

B. 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.

C. Product Labeling: Attach label from agency approved by authority having jurisdiction for products, assemblies, and systems required to be labeled by applicable code(s).

1. Label Information: Include manufacturer's or fabricator's identification, approved agency identification, and the following information, as applicable, on each label.

a. Model number.

b. Serial number.

c. Performance characteristics.

1.7 FIELD SAMPLES

A. Install field samples demonstrating quality level for the Work, at the site as required by individual specifications Sections for review and acceptance by Architect. Remove field samples prior to date of Final Inspection, or as directed.

1.8 MOCK-UPS

A. Comply with requirements of Section 01 43 39 - MOCK-UPS.

1.9 MANUFACTURER’S FIELD SERVICES AND REPORTS

A. When called for by individual Specification Sections, provide at no additional cost to the Owner, manufacturers’ or product suppliers’ qualified staff personnel, to observe site conditions, start-up of equipment, adjusting and balancing of equipment, conditions of surfaces and installation, quality of workmanship, and as specified under the various Sections.

1. Individuals shall report all observations, site decisions, and instructions given to applicators or installers. Immediately notify Architect of any circumstances which are supplemental, or contrary to, manufacturer's written instructions.

2. Submit full report within 30 calendar days from observed site conditions to Architect for review.

1.10 FIELD QUALITY CONTROL

A. The Owner reserves the right to take samples and perform, at random, tests of approved materials delivered to the job site to verify compliance of actual materials with specifications.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 01 45 23

TESTING AND INSPECTION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Special Inspections and Structural Testing Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents and Chapter 17 *of the Building Code of New York State* (BCNYS) including, but not limited to the following:

1. Steel Construction – BCNYS Section 1704.3 & Table 1704.3
2. Concrete Construction – BCNYS Section 1704.4 & Table 1704.4
3. Masonry Construction – BCNYS Section 1704.5 & Tables 1704.5.1, 1704.5.3
4. Soils – BCNYS Section 1704.7

B. Hold a Special Inspections Preconstruction Meeting at least 7 days prior to the initial planned date for start of construction.

1. Discussions shall include the following:
   a. Review of specifications and Schedule of Special Inspections for work requiring Special Inspections.
   b. Responsibilities of Contractor, Owner, Testing Agency, Special Inspector and Registered Design Professional.
   c. Notification and reporting procedures.
2. Attendees shall include the Contractor, Owner's Representative, Testing Agency, Special Inspector and Registered Design Professionals for Structural Engineering and for Architecture.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the testing and inspection requirements as specified herein.

1.3 RELATED SECTIONS

A. Requirements for testing and inspection shall be described in various Sections of these Specifications. Where no testing and inspection requirements are described but the Owner determines that it is necessary, the Owner may request additional testing and inspection to be performed at his own expense.

B. Work Not Included

1. Unless otherwise noted in this Section or other Section of work, the Owner will select a pre-qualified independent testing laboratory and inspection professional.

2. Unless otherwise noted in this Section or other Sections of work, the Owner will pay for all initial services of the testing laboratory and inspection professionals as further described in Article 2.1 of this Section of these Specifications.

1.4 QUALITY ASSURANCE

A. The testing laboratory will be qualified to the Owner's approval in accordance with ASTM E 329-95 "Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction."

B. Testing, when required, will be in accordance with all pertinent codes and regulations and with selected standards of the American Society for Testing and Materials.

1.5 PRODUCT HANDLING

A. Promptly process and distribute all required copies of test reports and related instructions to ensure all necessary retesting and/or replacement of materials with the least possible delay in progress of the work.

PART 2 PRODUCTS

2.1 PAYMENTS FOR TESTING AND INSPECTION SERVICES

A. Initial Services: The Owner will pay for all initial testing and inspection services.

B. Retesting and Cancelled Tests and Inspections: When initial tests and inspections indicate non-compliance with local Codes and the Contract Documents, all subsequent retesting occasioned by the non-compliance shall be performed by the same testing laboratory and inspectors and the costs thereof will be deducted by the Owner from the Contract Sum.

2.2 CODE COMPLIANCE TESTING AND INSPECTION

A. Inspections and tests required by Codes or Ordinances, or by a plan approval authority, shall be paid by for by the Owner unless otherwise noted in this Section or other Sections of work. Retesting or inspection as required shall conform to the requirements of Article 2.1 B of this Section.

1. Required Building Department Inspections:
    a. Excavation and Footing Forms
    b. Foundation Walls
    c. Slab Inspection
    d. Framing
    e. Plumbing Underground
    f. Plumbing – Waste & Vents
    g. Plumbing – Gas
    h. Electrical – Wiring and Final
    i. HVAC
    j. Insulation
    k. Final

2. For all above inspections, the Inspector must be accompanied by the Contractor whose work is being inspected.

2.3 CONTRACTOR'S TESTING

A. Inspection or testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

B. Where operating tests are specified, the Contractor shall test his work as it progresses, on his own account, and shall make satisfactory preliminary tests in all cases before applying for official tests.

C. Tests shall be made in the manner specified, for the different branches of the work. Each test shall be made on the entire system for which such test is required, wherever practical. In case it is necessary to test portions of the work independently, the Contractor shall do so without extra compensation. The Contractor shall furnish all labor, material and apparatus, make corrections and conduct the official test. The test will be conducted in the presence of a representative of the Architect.

D. All parts of the mechanical and electrical work and associated equipment shall be tested and adjusted to work properly and be left in perfect operating condition. All defects disclosed by these tests shall be corrected to the satisfaction of the Architect and Engineer without any additional cost to the Owner. Tests shall be repeated on this repaired or replaced work if deemed necessary by the Architect. The Architect shall be notified at least forty-eight (48) hours in advance of all tests, and shall be represented at tests that he deems necessary. The Contractor shall furnish all necessary instruments, other equipment, and personnel required for such tests.

E. Required certificates of inspection, testing or approval shall be secured by the Contractor and promptly delivered by him to the Architect.

F. If the Architect or Engineer is to observe the inspections, tests or approvals required by the Contract Documents, he will endeavor to do so promptly and, where practicable, at the source of supply.

PART 3 EXECUTION

3.1 COOPERATION WITH TESTING LABORATORY AND INSPECTORS

A. Representatives of the testing laboratory and inspectors shall have access to the work at all times. Provide facilities for such access in order that they may properly perform their functions.

B. The Contractor shall cooperate with the Special Inspector and his agents so that Special Inspections and testing may be performed without hindrance.

C. The Contractor shall notify the Special Inspector and/or Testing/Inspecting Agency at least 48 hours in advance of a required inspection or test.

D. The Contractor shall provide incidental labor and facilities to provide access to the work to be inspected or tested, to obtain and handle samples at the site or at source or products to be tested, to facilitate tests and inspections, and for storage and curing of test samples.

E. If Special Inspections or testing require the use of the Contractor's scaffolding to access work areas, the Contractor shall provide a competent person to perform the daily evaluation of the scaffolding to verify that it is safe to use. The Contractor shall notify the Special Inspector and

Testing Agent of this review before each use. The Contractor is responsible for the safe assembly and stability of the scaffolding.

F. The Contractor shall keep the latest set of Construction Drawings, field sketches, accepted shop drawings and specifications at the project site for field use by the Inspectors and Testing Technicians.

G. The Contractor shall perform remedial work (if required) and sign non-conformance reports stating that remedial work has been completed. The Contractor shall submit signed reports to the Special Inspector as work proceeds.

H. The Special Inspection program shall in no way relieve the Contractor of his obligation to perform work in accordance with the requirements of the Contract Documents or from implementing an effective Quality Control program.

I. The Contractor shall be solely responsible for construction site safety.

3.2 SCHEDULES

A. Establishing Schedule: By advance discussions with the inspection service and testing laboratory selected by the Owner, determine the time required to perform inspections and tests and to issue each of its findings. Provide all required time within the construction schedule.

B. Revising Schedule: When changes of construction schedule are necessary during construction, coordinate all such changes of schedule with the inspectors and testing laboratory as required.

C. Adherence to Schedule: When the testing laboratory is ready to test according to the determined schedule but is prevented from testing or taking specimens due to incompleteness of the work, all extra costs for testing attributable to the delay will be back-charged to the Contractor.

3.3 TAKING SPECIMENS

A. All specimens and samples for testing, unless otherwise provided in these Contract Documents, will be taken by the testing laboratory; all sampling equipment and personnel will be provided by the testing laboratory; and all deliveries of specimens and samples to the testing laboratory will be performed by the testing laboratory.

END OF SECTION 01 45 23

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

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 requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Sections include the following:

1. Division 0 for Construction Implementation Plan

2. Division 1 for limitations on utility interruptions and other work restrictions.
3. Division 1 Section “Summary of Multiple Contracts” for division of responsibilities for temporary facilities and controls.
4. Division 1 Section “Submittal Procedures” for procedures for submitting copies of implementation and termination schedule and utility reports.
5. Division 1 Section “Execution Requirements” for progress cleaning requirements.
6. Divisions 2 through 33 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.
7. Division 31 Section “Dewatering” for disposal of ground water at Project site.
8. Division 32 Section “Exterior Improvements” for temporary roads and paved areas.

1.3 DEFINITIONS

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

1.4 USE CHARGES

A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner’s construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.

B. Water and Electric Power Service: Use charges are specified in Division 1 Section “Summary of Multiple Contracts.”

1.5 SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel. See also Spec Section 00 92 00 Construction Implementation Plan

1.6 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.

1.7 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Installer of each permanent service shall 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 MATERIALS

A. Pavement: Comply with Division 32 pavement Sections.

B. Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top rails.

C. Portable Chain-Link Fencing: Minimum 2-inch, 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide concrete bases for supporting posts.

D. Lumber and Plywood: Comply with requirements in Division 6 Section "Rough Carpentry."

E. Gypsum Board: Minimum 1/2 inch thick by 48 inches wide by maximum available lengths; regular-type panels with tapered edges. Comply with ASTM C 36/C 36M.

F. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

G. Paint: Comply with requirements in Division 9 painting Sections.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Construction Manager Field Office: Provide a separate insulated, weather-tight, heated and air-conditioned field office for use by only Construction Management personnel engaged in construction activities; of sufficient size to accommodate required office personnel and meetings of 20 persons at Project site. Construction Manager Field office to be maintained for the **DURATION** of the project.

1. Furnish and equip each office as follows:

    a. Provide two rooms each furnished with one desk and three chairs, four-drawer file cabinet, a plan table, a plan rack, 4-foot-square tack board and bookcase.
    b. Provide one room of not less than 240 sq. ft. for Project meetings. Furnish room with conference table, 20 folding chairs, 3-foot by 4-foot white marker board, and 4-foot-square tack board.
    c. Water cooler and private toilet complete with water closet, lavatory, and medicine cabinet with mirror.
    d. Provide one 3.6 cu. ft. refrigerator.
    e. Provide one microwave.
    f. Provide one first aid kit: Johnson and Johnson Co., Model No. 25 or equal.
    g. Provide one EcoTank Pro ET-5170 Wireless All-in-One Supertank Printer:
        1) Provide ink and supplies for the project duration
    h. Provide 20-reams (5,000 sheets) of 8-1/2-inch by 11-inch, 24-pound laser paper
    i. Provide one personal computer from the following options, including all required cables, with the following attributes:
        1) DELL or HP Business Classic PC
        2) 8th Generation Intel Newest Intel i7 -13th or 14th Generation
        3) Windows 11 Pro 64-bit English
        4) MS Office 365
        5) 24” LCD monitor
        6) 64GB, DDR4, 2666MHz
        7) 3.5 inch 2TB SSD 7200rpm SATA Hard Drive
        8) Wireless and Ethernet Networking

    j. SSD External Hard Drive 2TB

    k. Provide security bars at doors and security screens at all windows.

    l. Provide stairs at each door.

2. Provide heater with thermostat capable of maintaining a uniform indoor temperature of 68 deg F.
3. Provide fluorescent light fixtures capable of maintaining average illumination of 25 fc at desk height. Provide 110- to 120-V duplex outlets spaced at not more than 12-foot intervals, 1 per wall in each room.
4. Provide one large and two small trash cans with bags for project duration.
5. Janitorial Services: Provide janitorial services on a weekly basis for temporary Construction Manager field office.
6. The contents of the Field Office shall become the property of the Owner upon Substantial Completion of the Contract.

C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

2.3 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 Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
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.

PART 3 - EXECUTION

3.1 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 and to limit site disturbance.

B. Provide each facility ready for use when needed to avoid delay. Do not remove without approval of Construction Manager, and until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 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. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

1. Where installations below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize water damage. Drain accumulated water promptly from pans.
2. Hose-Bib, Backflow-Prevention Devices: ASSE standard, nonremovable-type, backflow-prevention devices with ASME B1.20.7, garden-hose threads on outlet.
3. Water service piping to be copper tube or polyvinyl chloride (PVC) plastic pipe.
4. Provide one hose bib at point where temporary service connects to existing or new water service, after back-flow protection.
5. Provide one hose bib on each story of structure at earliest time possible in vicinity of Stair 1.
6. Provide protective enclosure if temporary service connects to new or existing service outside the building, complying with the following:

a. Freeze-Protection Enclosures: Insulated and with heat source to maintain minimum internal temperature of 40 deg F when external temperatures reach as low as minus 34 deg F.

1) Housing: Reinforced-aluminum or -fiberglass construction.
2) Drain opening for units with drain connection.
3) Access doors with locking devices.
4) Insulation inside housing.
5) Anchoring devices for attaching housing to concrete base.
6) Electric heating cable or heater with self-limiting temperature control.
7) Precast concrete base of dimensions required to extend at least 6 inches beyond edges of enclosure housings. Include openings for piping.
8) Electrical Contract shall provide power to enclosure as indicated.
9) Class I-V: For pressure or atmospheric vacuum breaker equipment or devices. Include drain opening in housing.

7. Provide back-flow protection at point where service connects to new or existing service, complying with the following:

a. Pipe-Applied, Atmospheric-Type Vacuum Breakers: ASSE 1001, with floating disc and atmospheric vent.

C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities. Maintain and clean all sanitary facilities.

1. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.

D. Heating: Provide temporary heating 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.

E. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

F. 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.
2. Install main temporary electric panel in an accessible location determined by the Construction Team and a secondary temporary electric panel within 50 feet of the main temporary electric panel by the proposed building area on each floor as required to meet the needs of the project (Exact Locations to be determined).

G. Electric Distribution: Provide receptacle outlets adequate for connection of power tools and equipment.

1. Provide waterproof connectors to connect separate lengths of electrical power cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
2. Provide warning signs at power outlets other than 110 to 120 V.
3. Provide 4-gang outlets, spaced so 75-foot extension cord can reach each area for power hand tools and task lighting. Provide a separate 125-V ac, 20-A circuit for each outlet.

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.
2. Install lighting for Project identification sign.
3. Provide one 100-W incandescent lamp every 20-feet in traffic areas.
4. Provide two 100-W incandescent lamps per story in stairways and ladder runs, located to illuminate each landing and flight.
5. Install exterior-yard site lighting that will provide adequate illumination for construction operations, traffic conditions, and signage visibility when the Work is being performed.

I. Telephone Service: Provide temporary telephone service in each field office for use by all construction personnel. Install one telephone line(s) for each field office.

1. Provide additional telephone lines for the common-use field office as follows:

a. Provide a dedicated telephone line for facsimile machine and computer.
b. Provide second voice line for general use.

2. At each telephone, post a list of important telephone numbers.

a. Police and fire departments.
b. Ambulance service.
c. Contractor’s home office.
d. Architect’s office.
e. Engineers’ offices.
f. Owner’s office.
g. Principal subcontractors’ field and home offices.

J. Electronic Communication Service: Provide temporary electronic communication service, including electronic mail, in each facility.

1. Provide high speed internet line in CM field office.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.

2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas in same location as permanent roads and paved areas. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Division 31 Section "Earthwork."
3. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Division 32 Section "Hot-Mix Asphalt Paving."

C. 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.

D. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

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 nor endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

F. Project Identification and Temporary Signs: Provide Project identification and other signs. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.

1. Provide temporary, directional signs for construction personnel and visitors.
2. Maintain and touchup signs so they are legible at all times.

G. 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 Division 1 Section "Execution Requirements" for progress cleaning requirements.

H. Temporary Elevator Use: Refer to Division 14 Sections for temporary use of new elevators.

I. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

J. Temporary Use of Permanent Stairs: Cover finished, permanent stairs with protective covering of plywood or similar material so finishes will be undamaged at time of acceptance.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Division 1 Section “Summary.”

B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

1. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

C. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

D. 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.

E. 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. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.

F. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates. Refer to Construction Implementation Plan (CIP-1).

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. Provide Owner with two sets of keys.

G. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

I. 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 not complete, insulate temporary enclosures.

J. 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.

1. Prohibit smoking in construction areas.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction. Provide a Fire-Watch for work performed after hours.
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.

3.5 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. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 1 Section “Closeout Procedures.”

END OF SECTION 015000

SECTION 01 55 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete product requirements as specified herein, including, but not limited to, the following:

1. Product delivery, storage and handling.
2. Storage and protection.
3. Identifying markings.
4. Substitution requirements.
5. Temporary use of equipment.
6. General standards.

1.3 RELATED SECTIONS

A. Execution Requirements - Section 017300.

1.4 TRANSPORTATION AND HANDLING

A. Materials, products, and equipment shall be properly containerized, packaged, boxed, and protected to prevent damage during transportation and handling.

B. More detailed requirements for transportation and handling are specified under the technical Sections.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.

2. Store materials in a manner that will not endanger Project structure.

3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.

4. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.

5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

6. Protect stored products from damage and liquids from freezing.

7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.6 IDENTIFYING MARKINGS

A. Name plates and other identifying markings shall not be affixed on exposed surfaces of manufactured items installed in finished spaces.

1.7 PRODUCT APPROVAL STANDARDS

A. Where the words "or approved equal" or other synonymous terms are used, it is expressly understood that they shall mean that the approval of any such submission is vested in the Architect, whose decision shall be final and binding upon all concerned. All submissions are subject to such approval and shall conform to the requirements of Article 1.8 herein.

1.8 SUBSTITUTIONS

A. After the contract has been executed, the Architect will consider a formal request for the substitution of products in place of those specified, under the following conditions:

1. The request is accompanied by complete data on the proposed substitution substantiating compliance with the Contract Documents including product identification and description, performance and test date, references and samples where applicable, and an itemized comparison of the proposed substitution with the products specified or named by Addenda, with data relating to Contract time schedule, design and artistic effect where applicable, and its relationship to separate contracts.

2. The request is accompanied by accurate cost data on the proposed substitution in comparison with the product specified, whether or not modification of the Contract Sum is to be a consideration.

B. Requests for substitution based on Para (1) above, when forwarded by the Contractor to the Architect for review are understood to mean that the Contractor:

1. represents that he has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified:

2. will provide the same guarantee for the substitution that he would for that specified;

3. certifies that the cost data presented is complete and includes all related costs under this Contract, but excludes costs under separate contracts and the Architect's redesign costs, and that he waives all claims for additional costs related to the substitution which subsequently become apparent; and

4. will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects, at no additional cost to the Owner and at no extension of the contract completion date.

C. Substitutions will not be considered if:
1. they are indicated or implied on shop drawings submissions without the formal request required in Para (1) above; or

2. for their implementation they require a substantial revision of the Contract Documents in order to accommodate their use.

3. The Architect will examine, with reasonable promptness, such substitution submittals, and return of submittals to the Contractor shall not relieve the Contractor from responsibility for deviations and alternatives from the contract plans and specifications, nor shall it relieve him from responsibility for errors in the submittals. A failure by the Contractor to identify in his letter of transmittal material deviations from the plans and specifications shall void the submittals and any action taken thereon by the Architect. When specifically requested by the Architect, the Contractor shall resubmit such shop drawings, descriptive data and samples as may be required to evaluate substitutions.

D. If any mechanical, electrical, structural, or other changes are required for the proper installation and fit of alternative materials, articles, or equipment, or because of deviations from the contract plans and specifications, such changes shall not be made without the consent of the Architect and shall be made without additional cost to the Owner.

1.9 TEMPORARY USE OF EQUIPMENT

A. No equipment intended for permanent installation shall be operated for temporary purposes without the written permission of the Architect.

B. The temporary or trial usage by the Owner of any mechanical device, machinery, apparatus, equipment or any work or materials supplied under this Contract before final completion and written acceptance by the Architect, shall not be construed as evidence of the acceptance of same by the Owner. The Owner shall have the privilege of such temporary and trial usage, for such reasonable length of time as and when the Architect shall deem to be proper for making a complete and thorough test of same and no claim for damage shall be made by the Contractor for the injury to or breaking of parts of such work which may be caused by weakness or inaccuracy of structural parts or by defective material or workmanship. If the Contractor so elects, he may at his own expense, place a competent person or persons to make such trial usage; such trial usage shall be under the supervision of the Contractor.

1.10 GENERAL REQUIREMENTS

A. In the event that it is necessary for the Contractor to store any materials offsite, he shall first obtain the approval of the Architect. The Contractor shall be responsible for insurance and warehousing charges of any materials stored offsite. The Contractor shall also be responsible for the cost of delivery to the job site of any materials that have been stored offsite.

B. Materials delivered to the job site shall be carefully stored and protected from damage. Damaged material shall not be used in the work. The Contractor shall provide, where directed temporary storage facilities as may be required for the storage of all materials which might be damaged by weather.

C. Manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the representative manufacturers, unless otherwise specified.

D. Equipment, plant, and appliances, such as hoists, centering, concrete lifts, construction elevators, cranes, rigging, towers, derricks, walks, ramps, chutes, scaffolding, implements, transportation, cartage and other things necessary and required for the adequate execution of the work and as required by law and applicable Union rules shall be provided and shall be maintained in good and safe mechanical working order, be responsible for their safe use, and remove them when no longer required. Applicable requirements of OSHA shall become and form a part of this document.

E. During handling and installation of work at project site clean and protect work in progress and adjoining work on a basis of perpetual maintenance. Apply suitable protective covering on newly installed work where reasonably required to ensure freedom from damage or deterioration at time of substantial completion; otherwise, clean and perform maintenance on newly installed work as frequently as necessary through remainder of construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

F. To extent possible through reasonable control and protection methods, supervise performance of work in a manner and by means which will ensure that none of the work whether completed or in progress, will be subjected to harmful, dangerous, damaging, or otherwise deleterious exposures during construction period. Such exposures include (where applicable, but not by way of limitation) static loading, dynamic loading, internal pressures, external pressures, high or low temperatures, thermal shock, high or low humidity, air contamination or pollution, water, ice, solvents, chemicals, light, radiation, puncture, abrasion, heavy traffic, soiling, bacteria, insect infestation, combustion, electrical current, high speed operation, improper lubrication, unusual wear, misuse, incompatible interface, destructive testing, misalignment, excessive weathering, unprotected storage, improper shipping/handling, theft and vandalism.

G. Require installer of each major unit of work to inspect substrate to receive the work, and conditions under which the work will be performed, and to report (in writing to Contractor) unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

H. Where installations include manufactured products, comply with manufacturer's applicable instructions and recommendations for installation to whatever extent these are more explicit or more stringent than applicable requirements indicated in the Contract Documents.

I. Inspect each item of materials or equipment immediately prior to installation and reject damaged and defective items.

J. Provide attachment and connection devices and methods for securing work properly as it is installed; true to line and level, and within recognized industry tolerance if not otherwise indicated. Allow for expansions and building movements. Provide uniform joint widths in exposed work, organized for best possible visual effect. Refer questionable visual-effect choices to Architect for final decision.

K. Recheck measurements and dimensions of the work as an integral step of starting each installation.

L. Install work during conditions of temperature, humidity, exposure, forecasted weather, and status of project completion which will ensure best possible results for each unit of work in coordination with entire work. Isolate each unit of work from non-compatible work, as required to prevent deterioration.

M. Coordinate enclosure (closing-in) of work with required inspections and tests, so as to avoid necessity of uncovering work for that purpose.

N. Mounting Heights: Except as otherwise indicated, mount individual units of work at industry-recognized standard mounting heights, for applications indicated. In CMU walls mount units at height closest to manufacturer's recommendation so as to minimize cutting of block coursings. Refer questionable mounting height choices to Architect for final decision.

END OF SECTION 016000

SECTION 01 60 00
REGULATORY REQUIREMENTS

PART 1.00 - GENERAL

1.01 RELATED DOCUMENTS

A. The General Contract Provisions and the General Requirements of Division 1 apply to the work of this Section.

B. Particular coordination is required in connection with Sections for Demolition which must be recognized as containing supplements to this Section of the Specifications.

1.02 LAWS, CODES, ORDINANCES, PERMITS, FEES, ETC.

A. All necessary permits from the municipal or other public authorities shall be secured and paid by the Contractor who shall give all notices required by Law, Municipal Ordinances, or the Rules and Regulations of the various Municipal Bureaus or Departments, and also as a part of the Contract, shall comply with all Federal and State laws and all Municipal Ordinances or Regulations that may be applicable to this work which shall be issued (in compliance with Ordinances or Regulations existing at the time of Notice to Proceed) by any or all of said Departments as applying to the work of the Contract.

B. Wherever in these Specifications the name of an Official, Bureau or Department is mentioned, it is intended to mean that Official, Bureau, or Department having jurisdiction.

C. The Contractor shall deliver to the Owner all permits or certificates of approval and inspections issued by all Agencies having jurisdiction in connection with this work, before the certificate for final payment is issued.

D. Laws, Codes, Provisions - Comply with:

1. New York State Building Code

2. NFPA 101

3. OSHA

4. Westchester County Department of Health – Air Quality Control

5. See other codes and ordinances referenced therein.

6. In case of conflicting requirements between the various codes, the Contract Documents or any other Local and State Codes or Ordinances having jurisdiction, the most stringent shall govern.

E. It is the intention of these Contract documents that the contractor's work be fully in compliance with all applicable codes and ordinances and that the cost of such compliance is included in the Contract Price. If there are errors or omissions in the contract documents which would result in work that was not in compliance with all the applicable codes and ordinances then the contractor shall not proceed but shall notify the architect in writing. The Contractor shall have included in the contract price the cost of all such work even in the case of errors or omissions to the contract documents if such errors and omissions could have been readily ascertainable through the exercise of reasonable diligence by the contractors.

END OF SECTION 01 60 00

SECTION 01 73 00- PROJECT EXECUTION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

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

1. Construction layout.
2. Field engineering and surveying.
3. General installation of products.
4. Progress cleaning.
5. Starting and adjusting.
6. Protection of installed construction.
7. Correction of the Work.

1.3 RELATED SECTIONS

A. Cutting and Patching - Section 01 73 29.

B. Closeout Procedures - Section 01 77 00.

1.4 SUBMITTALS

A. Qualification Data: For land surveyor to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

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

D. Certified Surveys: Submit two copies signed by land surveyor.

E. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.5 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

PART 2 PRODUCTS

(Not Applicable)

PART 3 EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

1. Before construction, verify the location and points of connection of utility services.

B. Existing Utilities: Before beginning site work, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

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

a. Description of the Work.
b. List of detrimental conditions, including substrates.
c. List of unacceptable installation tolerances.
d. Recommended corrections.

2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.

4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.

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

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

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

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

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.

2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.

3. Inform installers of lines and levels to which they must comply.

4. Check the location, level and plumb, of every major element as the Work progresses.

5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.

6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical

work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.

2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.

3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

C. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and site work.

D. Final Property Survey: Prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.

2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

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

1. Make vertical work plumb and make horizontal work level.

2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.

3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

4. Maintain minimum headroom clearance of 8 feet in spaces without a suspended ceiling.

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

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

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

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.

2. Allow for building movement, including thermal expansion and contraction.

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

H. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.

2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg. F.

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

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

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

1. Remove liquid spills promptly.

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

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

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

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

G. Cutting and Patching: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

1. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

H. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

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

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

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

3.7 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

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

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

3.9 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

SECTION 01 73 29- CUTTING AND PATCHING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. This Section includes procedural requirements for cutting and patching. Each Prime Contractor is responsible for their own cutting and finish patching.

1.3 RELATED SECTIONS

A. Refer to Divisions 3 through 34 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1. Requirements in this Section apply to mechanical and electrical installations. Refer to Divisions 22, 23 and 26 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.4 DEFINITIONS

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

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.5 SUBMITTALS

A. Cutting and Patching: Submit a method describing procedures at least **10 days before** the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.

2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.

3. Products: List products to be used and firms or entities that will perform the Work.

4. Dates: Indicate when cutting and patching will be performed.

5. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.

6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.

7. Architect's Approval: Obtain approval of cutting and patching before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.6 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

1. Provide a list of additional elements that are structural elements and that require Architect's or Construction Manager's approval of a cutting and patching proposal.

B. Operational Elements: Do not cut and patch the following operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

1. Primary operational systems and equipment.

2. Air or smoke barriers.

3. Fire-protection systems.

4. Control systems.

5. Communication systems.

6. Conveying systems.

7. Electrical wiring systems.

C. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

1. Water, moisture, or vapor barriers.

2. Membranes and flashings.

3. Exterior curtain-wall construction.

4. Equipment supports.

5. Piping, ductwork, vessels, and equipment.

6. Noise- and vibration-control elements and systems.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or

in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding

1.7 WARRANTY

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

PART 2 PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections of these Specifications.

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

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

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PERFORMANCE

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

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

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

ply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. In-Place Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.

5. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

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

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

4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weather-tight condition.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty and similar materials.

END SECTION 017329

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for the following:

1. Disposing of non-hazardous demolition and construction waste.

B. Related Sections include the following:

1. Division 01 Section “Temporary Facilities and Controls” for environmental-protection measures during construction, and location of waste containers at Project site.

1.3 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

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.

1.4 SUBMITTALS

A. 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. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged or reused, 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. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off Owner’s property and legally dispose of them.

END OF SECTION 01 74 19

SECTION 01 75 00
STARTUP AND TESTING

PART 1 - GENERAL

1.01 WORK INCLUDED:

This Section includes the startup and testing services required during system startup.

1.02 SYSTEM DESCRIPTION:

A. The Contractor shall perform startup to the satisfaction of the Engineer and Owner. Startup and testing shall not be initiated until all required certifications and other required documentation has been submitted, as described herein.

B. The purpose of the startup test is to provide a final operational checkout of all equipment prior to beneficial use by the Owner.

C. Substantial Completion of the project shall not be certified until successful completion of startup.

1.03 RELATED WORK:

A. Section 01 75 13, EQUIPMENT CHECKOUT AND TESTING

B. Section 01 90 00, COMMISSIONING

B. Divisions 11 through 33

1.04 SEQUENCING:

Testing, operator training and other like services to be provided under the technical sections of the specifications are not to be performed during startup without written authorization from the Engineer.

1.05 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF THE GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

A. Three copies of the following shall be forwarded to the Engineer for review two (2) weeks prior to commencement of startup:

1. Certification by a representative of the manufacturer that each piece of equipment has been installed properly and is ready for operation.

2. Certification by a representative of the equipment manufacturer that all equipment requiring calibration has been properly calibrated.

3. A schedule of the testing, including staffing, and specific testing and operation of individual equipment items.

B. At the conclusion of the test, all information recorded during the test shall be forwarded to the Engineer.

C. This test is not to be utilized as a general debugging of the system. All equipment shall be started, tested and calibrated prior to this test. This includes automatic and manual operation as well as instrumentation interfacing.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

3.01 PREPARATION:

A. Prior to commencement of testing, the Engineer shall be given three (3) days' written notice.

B. The Contractor shall complete final debugging prior to startup.

C. All telemetry equipment shall be operational prior to testing.

D. The test shall be performed.

E. Part of the test shall be accomplished on standby power.

3.02 TEST PROCEDURES:

A. It is the general responsibility of the Contractor to insure that all equipment is completely operational throughout the test; provide the Engineer with proper technical assistance as required to completely test all equipment and alarms; provide adequately trained personnel who can operate equipment on an on/off basis so that the equipment is not damaged, whether the Engineer or Owner is present or not during that portion of the test.

B. It is the general responsibility of the Engineer and Owner during the test period to supervise the testing of all equipment, associated alarms and devices; to vary the operation of the equipment as necessary.

3.03 STOPPING OF TEST:

A. The Engineer shall stop the testing for any of the following reasons:

1. Failure of critical system, including:

a. Pumps
b. HVAC Equipment
c. Industrial Equipment
b. Telemetry Equipment
c. Instrumentation
d. Standby Generating System
e. Additional equipment as indicated in the Contract Documents

2. Failure of any of the above systems to operate on standby power.

B. If the test is stopped for any reason, the test shall be restarted from the beginning. The Contractor shall pay all costs associated with the Owner and Engineer supervising additional testing as required.

3.04 EXPENDABLES:

Unless otherwise indicated, the General Contractor shall be responsible for providing all fuel during construction.

END OF SECTION

SECTION 01 75 13
EQUIPMENT CHECKOUT AND TESTING

PART 1 - GENERAL

1.01 DESCRIPTION:

A. The physical checkout and testing requirements in this Section are in addition to those requirements defined in the technical specifications.

1.02 RELATED WORK:

A. Section 01 75 00, STARTUP AND TESTING

B. Section 01 90 00, COMMISSIONING

C. Division 14 through Division 33

1.03 DEFINITIONS:

A. Shop Testing is defined as testing that is performed by the manufacturer either at the place of manufacture, or the place of assembly, for the purpose of proving that the equipment meets the requirements of the technical specification(s).

B. Physical Checkout is defined as the process whereby the Contractor physically inspects products after they have been installed in the work, and certifies that the products have been properly and completely installed, and are ready for field testing.

C. Field Testing is defined as testing that is performed on products by the Contractor with the assistance of the manufacturer's representative, after the performance of physical checkout, for the purpose of proving that the tested products meet the specifications. While field testing can be described as "shop testing in the field", it may be required whether or not shop testing was performed on the product.

D. System Testing is defined as testing performed on a "system" normally comprised of two or more pieces of equipment, after physical checkout and field testing have been completed, for the purpose of proving that the system meets specifications. System testing is described in Section 01 75 00, STARTUP AND TESTING.

E. Manufacturer's representative, sometimes referred to as the Factory-Trained Service Technician, is defined as a person provided by the manufacturer, who is qualified by training and experience to provide technical and process related advice, and/or assistance, relating to the installation or utilization of the products provided by the manufacturer. Minimum training and experience shall include not less than three years participation in similar work, including no less than three similar projects during this three-year period.

1.04 SHOP TESTING:

A. When required by the specifications, shop testing shall be performed prior to delivery of the equipment or material. If shop testing is not required by the technical specifications, provide shop testing as detailed in Paragraph 1.06. Provide a minimum of fifteen days written notice, indicating the time and place of testing. Submit the following to the Engineer for approval not less than fifteen days prior to this notice.

1. Description of the test - Outline how the tests will conform to the requirements of the specifications.

2. Testing devices that will be used in the tests - description must state how the devices will perform or what they will measure, and the device accuracy. Submit sample measurement results and catalog cuts.

3. Schedule for testing - schedule shall include frequency of measurements, personnel present, and contingency plans for equipment and/or test failure.

4. Test forms - submit samples of all forms used to record and report on shop test data. Forms shall include description of test, test date, equipment used, equipment tested, personnel present, equipment tag ID numbers, and measurements made. Forms shall have a place for signature by the chief testing person, and an officer of the manufacturer certifying that the tests results shown are true, accurate, have met the required criteria, and that the equipment will operate as indicated.

B. Submit the following to the Engineer within one week after completion of the tests.

1. Completed test forms for each device tested.

2. Completed certification.

3. A written summary of testing, reporting results.

4. A schedule for retesting, if necessary. Perform any retesting required to fulfill the specification test requirements at no additional cost to the Owner.

1.05 PHYSICAL CHECKOUT:

A. Physical checkout shall include the following, where applicable:

1. Verify exterior areas for backfill, grading, surfacing, drainage, landscaping, roadways, fencing, and gates.

2. Verify buildings for structure, masonry, architectural, mechanical systems, electrical/lighting, communications, and HVAC.

3. Verify concrete structures for structural integrity, finish tolerance, durability, appearance, embedded and inserted items, painting and surface applications.

4. Verify steel structures for member alignment, connection bolt torque, connection weld integrity, painting, fire proofing and surface applications.

5. Verify mechanical systems and items for setting, alignment and securing, check and adjust packing and seals, lubrication, drying out, drive connection and alignment including rotation and belt/chain tension, painting or surface applications, and tagging for project system.

6. Verify piping systems for material, size, components, direction, alignment of joints and bolts/welding, packing and seals, screens and filters and strainers, leak and pressure hydro tests, painting and color coding, hangers and anchors and expansion provision and supports, clean out of foreign matter and tagging for project system.

7. Verify electrical and control/instrumentation systems for conduit and tray installation, wire/cable material and size, circuit continuity and identification, voltage testing, ground continuity and testing, terminal installation and identification, jar switches and circuit breakers and transformers tested, substation operation tested, and tagging for project system.

8. Verify communication system including telephone, fire/smoke alarm, security, paging, closed circuit TV similar to electrical above.

9. Verify computer systems by station, function, network interface.

10. Each piece of equipment and system must be certified by the manufacturer's representative as described in subsection 1.07.

1.06 SERVICES OF THE MANUFACTURER'S REPRESENTATIVE:

A. Services of manufacturer's representatives shall be provided for equipment and systems specified in Divisions 14 through 33.

B. Contractor shall coordinate services of the various representatives to avoid overlap, thereby ensuring all work may be observed by the Engineer, and the Owner's operating personnel may receive all required training.

C. Contractor shall notify the Engineer in writing not less than ten working days prior to the visit of each manufacturer's representative.

D. Manufacturer's representative shall provide services specified in Divisions 14 through 33 as necessary. As a minimum, the services shall include the following:

1. When each piece of equipment or system has been installed, including connection of permanent power and control, the equipment or system shall be started up and fully inspected, aligned and adjusted, including provision of lubrication and all pre-operative maintenance.

2. Each piece of equipment or system shall be complete in all respects. Omission of any required items shall be corrected. Lack of discussion in the specifications of components which are necessary to equipment operation will not be accepted as the basis for an extra charge.

3. At the time of the inspection the representative shall provide a minimum of two additional hours to train the Owner's operations personnel in the operation and maintenance of the equipment or system.

4. Upon completion of this work the manufacturer's representative shall forward a copy of the report of his inspection to the Engineer via the Contractor. The report shall be on a form suitable to the Engineer and shall detail the work completed, deficiencies noted and/or corrected, any special instructions, and the names of Owner's personnel who received training. It shall also certify that the installation of the equipment or system is complete, ready for permanent operation, and free from any defects that would void the warranty.

5. Satisfactory certification of all individual equipment and systems must be received by the Engineer prior to the authorization to proceed with the overall start-up operation.

6. The manufacturer's representative shall return at a later date to supervise field tests, assist in start-up and perform any additional training required. Reports of these visits, specifically detailing the results of all field tests, shall be forwarded to the Engineer within 7 days of completion of the services.

1.07 CORRECTIONS TO THE WORK:

Correct any items of work failing to meet the specifications at no additional cost to the Owner. Correct the nonconforming items by re-work, modification, or replacement, at the option of the Engineer. Provide all required labor, materials, and retesting as specified herein, to verify that the equipment or system conforms to the specifications.

1.08 SAFETY:

Conduct all test procedures in compliance with all applicable safety standards and regulations.

END OF SECTION

SECTION 01 77 00

CLOSEOUT PROCEDURES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Project Record Documents.
3. Warranties.
4. Instruction of Owner's personnel.
5. Final cleaning.

1.3 RELATED SECTIONS

A. Execution Requirements - Section 017300.

B. Operating and Maintenance Data - Section 017823

1.4 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs and photographic negatives, damage or settlement surveys, property surveys, and similar final record information.

6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.

7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.

8. Complete startup testing of systems.

9. Submit test/adjust/balance records.

10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.

11. Advise Owner of changeover in heat and other utilities.

12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

13. Complete final cleaning requirements, including touchup painting.

14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

2. Results of completed inspection will form the basis of requirements for Final Completion.

1.5 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment.

2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

4. Submit pest-control final inspection report and warranty.

5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training videotapes.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.6 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

C. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.

2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

3. Include the following information at the top of each page:

a. Project name.
b. Date.
c. Name of Architect.
d. Name of Contractor.
e. Page number.

1.7 PROJECT RECORD DOCUMENTS

A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

B. Record Drawings: Maintain and submit one set of blue- or black-line white prints of Contract Drawings and Shop Drawings.

1. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
b. Accurately record information in an understandable drawing technique.
c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
d. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings.

2. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.

3. Mark important additional information that was either shown schematically or omitted from original Drawings.

4. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.

5. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.

C. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

3. Note related Change Orders, Record Drawings and Product Data, where applicable.

D. Record Product Data: Submit one copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.

3. Note related Change Orders, Record Drawings and Record Specifications, where applicable.

E. Miscellaneous Record Submittals: Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

F. All documents are to be submitted in paper and electronic format.

1.8 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2" x 11" paper.

2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.

3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

4. Provide electronic copy of all warranties, organized by product.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 EXECUTION

3.1 DEMONSTRATION AND TRAINING

A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Provide instructors experienced in operation and maintenance procedures.

2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.

3. Schedule training with Owner with at least seven days' advance notice.

4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.

B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:

1. System design and operational philosophy.

2. Review of documentation.

3. Operations.

4. Adjustments.

5. Troubleshooting.

6. Maintenance.

7. Repair.

3.2 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are neither planted nor paved to a smooth, even textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
h. Sweep concrete floors broom clean in unoccupied spaces.
i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
k. Remove labels that are not permanent.
l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
    1. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
n. Replace parts subject to unusual operating conditions.
o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
q. Clean ducts, blowers, and coils if units were operated without filters during construction.
r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
s. Leave Project clean and ready for occupancy.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.

D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 01 77 00

SECTION 01 78 23- OPERATING AND MAINTENANCE DATA

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the operating and maintenance data as specified herein.

1.3 RELATED SECTIONS

A. Submittal Procedures - Section 01 33 00.

B. Closeout Procedures - Section 01 77 00.

1.4 GENERAL

A. Compile product data and related information appropriate for Owner's maintenance and operation of products furnished under the Contract.

1. Contractors shall prepare operating and maintenance data as specified in this Section and as referenced in other pertinent sections of Specifications.

1.5 FORM OF SUBMITTALS

A. Prepare data in the form of an instructional manual for use by Owner's personnel.

B. All documents are to be submitted in paper and electronic format.

C. Format

1. Size: 8-1/2" x 11".

2. Paper: 20 pound minimum, white for typed pages.

3. Text: Manufacturer's printed data, or neatly typewritten.

4. Drawings

a. Provide reinforced punched binder tab, bind in with text.
b. Fold larger drawings to the size of the text pages.

5. Provide fly-leaf for each separate product, or each piece of operating equipment.

a. Provide typed description of product, and major component parts of equipment.
b. Provide indexed tabs.

6. Cover: Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS." List:

a. Title of Project.
b. Identity of separate structure as applicable.
c. Identity of general subject matter covered in the manual.

D. Binders

1. Commercial quality three-ring binders with durable and cleanable plastic covers.

2. Maximum Ring Size: 1 inch.

3. When multiple binders are used, correlate the data into related consistent groupings.

1.6 MANUAL FOR MATERIALS AND FINISHES

A. Submit three (3) copies of complete manual in final form.

B. Content, for architectural products, applied materials and finishes

1. Manufacturer's data, giving full information on products.

a. Catalog number, size, composition.
b. Color and texture designations.
c. Information required for re-ordering special-manufactured products.

2. Instructions for care and maintenance.

a. Manufacturer's recommendation for types of cleaning agents and methods.
b. Cautions against cleaning agents and methods which are detrimental to the product.
c. Recommended schedule for cleaning and maintenance.

C. Content, for moisture-protection and weather-exposed products

1. Manufacturer's data, giving full information on products.

a. Applicable standards.
b. Chemical composition.
c. Details of installation.

2. Instructions for inspection, maintenance, and repair.

1.7 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Submit three copies of complete manual in final form.

B. Content, for each unit of equipment and system, as appropriate.

1. Description of unit and component parts.

a. Function, normal operating characteristics, and limiting conditions.
b. Performance curves, engineering data and tests.
c. Complete nomenclature and commercial number of all replaceable parts.

2. Operating procedures

a. Start-up, break-in, routine and normal operating instructions.
b. Regulation, control, stopping, shut-down and emergency instructions.
c. Summer and winter operating instructions.
d. Special operating instructions.

3. Maintenance procedures

a. Routine operations.
b. Guide to "trouble-shooting."
c. Disassembly, repair and reassembly.
d. Alignment, adjusting and checking.

4. Servicing and lubrication schedule.

a. List of lubricants required.

5. Manufacturer's printed operating and maintenance instructions.

6. Description of sequence of operation by control manufacturer.

7. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.

a. Predicted life of parts subject to wear.
b. Items recommended to be stocked as spare parts.

8. As-installed control diagrams by controls manufacturer.

9. Each contractor's coordination drawings.

a. As-installed color coded piping diagrams.

10. Charts of valve tag numbers, with the location and function of each valve.

11. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

12. Other data as required under pertinent sections of specifications.

C. Content, for each electric and electronic system, as appropriate:

1. Description of system and component parts.

a. Function, normal operating characteristics, and limiting condition.
b. Performance curves, engineering data and tests.
c. Complete nomenclature and commercial number of replaceable parts.

2. Circuit directories of panel boards.

a. Electrical service.
b. Controls.
c. Communications.

3. As-installed color coded wiring diagrams.

4. Operating procedures

    a. Routine and normal operating instructions.
    b. Sequences required.
    c. Special operating instructions.

5. Maintenance procedures

    a. Routine operations.
    b. Guide to "trouble-shooting."
    c. Disassembly, repair and reassembly.
    d. Adjustment and checking.

6. Manufacturer's printed operating and maintenance instructions.

7. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

8. Other data as required under pertinent sections of specifications.

D. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel.

E. Additional requirements for operating and maintenance data: The respective sections of Specifications.

END OF SECTION 01 78 23

SECTION 01 78 39

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 01 78 23 "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(s) of marked-up record prints.

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 and directories of each submittal.

PART 2 - PRODUCTS

2.1 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. Record data as soon as possible after obtaining it.
c. Record and check the markup before enclosing concealed installations.

2. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect and Construction Manager. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Annotated PDF electronic file.
2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Architect through Construction Manager for resolution.
4. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.

C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Format: Annotated PDF electronic file.
2. 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.
3. Identification: As follows:

a. Project name.
b. Date.
c. Designation "PROJECT RECORD DRAWINGS."
d. Name of Architect and Construction Manager.
e. Name of Contractor.

2.2 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. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as scanned PDF electronic file(s) of marked-up paper copy of Specifications.

2.3 RECORD PRODUCT DATA

A. 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 and record Drawings where applicable.

B. Format: Submit record Product Data as scanned PDF electronic file(s) of marked-up paper copy of Product Data.

C. Provide PDF copy of all Project Record Documents on Thumb Drive for Owner

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

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. Maintenance of Record Documents and Samples: Store record documents and Samples 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 and Construction Manager's reference during normal working hours.

END OF SECTION 01 78 39

DOCUMENT 01 79 00
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. Preinstruction Conference: Conduct conference at Project site to comply with requirements in

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, through Construction Manager, 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.

PART 2 – PRODUCTS

PART 3 – EXECUTION

END OF DOCUMENT 017900

SECTION 01 90 00
COMMISSIONING

PART 1 - GENERAL

1.1 RESPONSIBLE PERSONNEL

A. Commissioning Authority: (TBD) will act as the Commissioning Authority. The Commissioning Authority works for the Engineer and directs and approves the commissioning work.

B. Responsibility of Disciplines: The parties listed below are part of the commissioning team and will be required to participate in the commissioning process. The responsibilities relative to commissioning for each of these parties is defined in this section.

1. Construction Manager
2. General Contractor
3. Plumbing Contractor
4. Mechanical Contractor
5. Electrical Contractor
6. Controls Subcontractor
7. Testing, Adjusting and Balancing Subcontractor
8. All other subcontractors that are associated with the above disciplines

1.2 DESCRIPTION

A. Commissioning. Commissioning is a systematic process of ensuring that all building systems perform interactively according to the design intent and the owner's operational needs. This is achieved by beginning in the design phase and documenting design intent and continuing through construction, acceptance and the warranty period with actual verification of performance.

Commissioning during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:

1. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing contractors.

2. Verify and document proper performance of equipment and systems in all seasons.

B. This project will have selected building systems commissioned in accordance with IECC 2018, as adopted in the 2020 Energy Conservation Construction Code of New York State. The commissioning process will be directed by a Commissioning Authority (CA)

whose services will be provided by the Engineer. All correspondence will flow through the Owner's Project Manager (PM).

C. Abbreviations. The following are common abbreviations used in the *Specifications* and in the commissioning process.

A/E -	Architect and design engineers	FT-	Functional performance test
CA-	Commissioning authority	GC-	General contractor (prime)
CC	Controls contractor	MC-	Mechanical contractor
CM -	Construction Manager	PC-	Prefunctional checklist
		PM-	Project manager (of the Owner)
Cx-	Commissioning	Subs-	Subcontractors to General
EC-	Electrical contractor	TAB-	Test and balance contractor

1.3 COORDINATION

A. Commissioning Team. The members of the commissioning team consist of the Commissioning Authority (CA), the Project Manager (PM), the designated representative of the Construction Management firm (CM), the General Contractor (GC or Contractor), the architect and design engineers, the Mechanical Contractor (MC), the Electrical Contractor (EC), the TAB representative, the Controls Contractor (CC), any other installing subcontractors or suppliers of equipment. The Owner's building or plant operator/engineer is also a member of the commissioning team.

B. Management. The CA directs and coordinates the commissioning activities through the CM. All members of the Commissioning Team work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents.

C. Scheduling. The CA will work with the CM according to established protocols to schedule the commissioning activities. The CA will provide sufficient notice to the CM for scheduling commissioning activities. The CM will integrate all commissioning activities into the master schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

The CA will provide the initial schedule of primary commissioning events at the commissioning scoping meeting. As construction progresses more detailed schedules are developed by the CA and incorporated into the project schedule by the CM.

1.4 COMMISSIONING PROCESS

A. Commissioning Process. The following narrative provides a brief overview of the typical commissioning tasks during construction and the general order in which they occur.

1. Commissioning during construction begins with a scoping meeting conducted by the CA wherein the commissioning process is reviewed with the commissioning team members and a preliminary plan is issued.

2. Two Additional meetings scheduled by the CA will be required during construction, to plan, scope, coordinate, and schedule future activities. The CA

will note equipment installation and startup issues while on-site for the two commissioning meetings and issue a follow-up site visit report.

3. Equipment documentation shall be submitted to the Engineer during normal submittals, including detailed start-up procedures. The CM will copy the CA on all equipment that is to be tested. The CA will use this information to create test procedures.

4. The CA may request additional information for manufacturers test procedures by submitting all requests through the CM who will forward to the contractor.

5. The Subcontractors develop startup checklists and prefunctional tests which are provided to the CM who will forward to the CA.

6. The Subcontractors execute and document the prefunctional checklists and perform startup and initial checkout.

7. The CA develops specific equipment and system functional performance test procedures. The Subcontractors review the procedures.

8. Functional Testing can only begin after Subcontractors provide written notice to CA that all startup and prefunctional checklists have been completed. The procedures are executed by the Subcontractors, under the direction of, and documented by the CA.

9. Preliminary Commissioning Report is issued by CA before Final Inspection can be performed by The Engineer.

10. Contractors submit O&M manuals for review by CA and Engineer.

11. Contractors perform seasonal tests as directed by the CA.

12. Final Commissioning report is issued by the CA after Contractor has addressed open issues and seasonal testing has been completed.

1.5 RELATED WORK

A. All of the following sections apply to the Work of this section.

22 00 00 Plumbing
23 00 00 Heating Ventilating and Air Conditioning
26 00 00 Electrical
14 21 23.16 Machine Room-Less Electric Traction Passenger Elevators

1.6 SYSTEMS TO BE COMMISSIONED

A. The following systems will be commissioned in this project. Testing requirements are part of this section. Each member of the commissioning team shall review all test procedures in this section to determine if his/her presence is required for each test.

Equipment and System	Functional Test Requirements Specified In:
Domestic Hot Water Heating	3.7
Variable Volume air handling units and VAV boxes	3.8
Makeup air unit	3.9
Miscellaneous metering, heating & cooling systems	3.10
Hot water heating systems	3.11
TAB for Air and Water	3.12
Electrical Lighting sensors and timers	3.13

1.7 RESPONSIBILITIES

A. The responsibilities of all parties in the commissioning process are provided in this section. The parties are as follows:
1. Commissioning Authority
2. Construction Manager
3. Plumbing Contractor
4. HVAC Mechanical Contractor
5. TAB Subcontractor
6. Controls Subcontractor
7. Electrical Contractor
8. Manufacturers' Representative for Commissioned Equipment

B. Commissioning Authority (CA):

The primary role of the CA is to observe and document performance—confirming that systems are functioning in accordance with the documented design intent and in accordance with the Contract Documents. The Contractors will demonstrate all tools or the use of tools to start, check-out and functionally test equipment and systems as requested by the CA.

1. Construction Phase

a. Coordinate the commissioning work and, with the CM, ensure that commissioning activities are being scheduled into the master schedule.

b. Plan and conduct a commissioning scoping meeting and other commissioning meetings as necessary.

c. Before startup, gather and review the submittals and control sequences. Work with contractors and design engineers until sufficient clarity has been obtained to write detailed testing procedures.

d. Review submittals for systems being commissioned for compliance with commissioning needs, concurrent with the A/E reviews. Provide feedback to the Engineer.

e. Perform two site visits to observe component and system installations. Obtain information on construction progress from the CM.

f. Approve systems startup by reviewing start-up reports and by selected site observation.

g. Approve air and water systems balancing by spot testing, by reviewing completed reports and by selected site observation.

h. Prepare functional performance test procedures for specific systems.

2. Acceptance Phase

a. Coordinate, witness and approve manual functional performance tests performed by installing contractors.

b. Analyze functional performance trend logs and monitoring data to verify performance.

c. Maintain a master deficiency and resolution log and a separate testing record. Provide the CM with written progress reports and test results.

d. Prepare a preliminary commissioning report

e. Review O&M manuals

f. Prepare a final commissioning report.

C. Construction Manager (CM):

1. Construction Phase

a. Facilitate the coordination of the commissioning work by the CA, and, with the CA, ensure that commissioning activities are being scheduled into the master schedule.

b. Attend a commissioning scoping meeting and other commissioning team meetings.

c. Perform the normal review of Contractor submittals. Provide copies of data pertaining to all equipment that will be commissioned to the CA.

2. Acceptance Phase

a. Review commissioning progress and deficiency reports.

b. Coordinate the resolution of non-compliance and design deficiencies identified in all phases of commissioning.

D. Mechanical, Controls and TAB Contractors:

The commissioning responsibilities applicable to each of the mechanical, controls and TAB contractors of Division 23 are as follows (all references apply to commissioned equipment only):

1. Construction Phases

a. Attend a commissioning scoping meeting and other meetings necessary to facilitate the Cx process.

b. Provide the CM with normal cut sheets and shop drawing submittals of commissioned equipment. The CM will forward a copy to the CA.

c. Contractors shall assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.

d. Provide assistance to the CA in preparing the specific functional performance test procedures. Subs shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.

e. Develop a full start-up and initial checkout plan using manufacturer's start-up procedures for all commissioned equipment. Submit to CA for review.

f. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CA.

g. Address current A/E punch list items before functional testing. Air and water TAB shall be completed with discrepancies and problems remedied before functional testing of the respective air- or water-related systems. Notify CA in writing when complete.

2. Acceptance Phase

a. Provide skilled technicians to execute starting of equipment and to execute the functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.

b. Provide skilled technicians to perform functional performance testing under the direction of the CA for specified equipment. Assist the CA in interpreting the monitoring data, as necessary.

c. Correct deficiencies (differences between specified and observed performance) as interpreted by the CA, CM and A/E and retest the equipment.

d. Make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in testing.

E. Mechanical Contractor:

The responsibilities of the HVAC mechanical contractor, during Construction Phases in addition to those listed in (F) are:

1. Assist and cooperate with the TAB contractor and CA by putting all HVAC equipment and systems into operation and continuing the operation during each working day of TAB and commissioning, as required.

2. List and clearly identify on the as-built drawings the locations of all air-flow stations and duct static pressure measuring points.

3. Notify the CM, who will notify the CA, of time and date for startup of each piece of equipment and TAB will occur. Be responsible to notify the CM ahead of time, when commissioning activities not yet performed will delay construction.

F. Controls Contractor:

1. The commissioning responsibilities of the controls contractor, during Construction Phases in addition to those listed in section (F) above are:

2. Sequences of Operation Submittals:

a. The Controls Contractor's submittals of control drawings shall include complete detailed sequences of operation for each piece of equipment, regardless of the completeness and clarity of the sequences in the specifications. They shall include:

1) All interactions and interlocks with other systems.

2) Detailed delineation of control between any packaged controls and the building automation system, listing what points the BAS monitors only and what BAS points are control points and are adjustable.

3) Written sequences of control for packaged controlled equipment.

4) Effects of power or equipment failure with all standby component functions.

5) Sequences for all alarms and emergency shutdowns.

6) Initial values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff.

7) Schedules, if known.

3. An updated as-built version of the control drawings and sequences of operation shall be included in the final controls O&M manual submittal.

4. Assist and cooperate with the TAB contractor in the following manner:

a. Meet with the TAB contractor prior to beginning TAB and review the TAB plan to determine the capabilities of the control system toward completing TAB. Provide the TAB any needed unique instruments for setting terminal unit boxes and instruct TAB in their use (handheld control system interface for use around the building during TAB, etc.).

b. Provide a qualified technician to operate the controls to assist the TAB contractor in performing TAB, or provide sufficient training for TAB to operate the system without assistance.

5. Assist and cooperate with the CA in the following manner:

a. Meet with the CA to review and explain how each control program is written relative to the specification and the control submittals. Provide detailed information to the CA on all setpoints (occupied, unoccupied, warmup), schedules, time delays, control differentials, interlocks, etc.

b. Using a skilled technician who is familiar with this building, execute the functional test procedures of the controls system as directed by the CA.

6. The controls contractor shall prepare a written plan indicating in a step-by-step manner, the procedures that will be followed to test, checkout and adjust the control system prior to functional performance testing.

7. Provide a signed and dated certification upon completion of the checkout of each controlled device, equipment and system prior to functional testing that all system programming is complete except for functional testing requirements.

8. List and clearly identify on the as-built duct and piping drawings the locations of all static and differential pressure sensors (air, water and building pressure).

G. TAB Contractor: The duties of the TAB contractor, in addition to those listed in (H):

1. Submit the outline of the TAB plan and approach for each system and component to the CM and the controls contractor six weeks prior to starting the TAB. The CM shall forward to the CA.

2. The submitted plan will include:

   a. Certification that the TAB contractor has reviewed the construction documents and the systems with the design engineers and contractors to sufficiently understand the design intent for each system.

   b. All field checkout sheets and logs to be used that list each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.

   c. Final test report forms to be used.

   d. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed.

   e. Details of how *total* flow will be determined (Air: sum of terminal flows via BAS calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations. Water: pump curves, circuit setter, flow station, ultrasonic, etc.).

   f. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and provide methods to verify this.

   g. Details of how minimum outside air cfm will be verified and set.

3. Submit hand-written reports of discrepancies, deficient or uncompleted work by others and lists of completed tests to the CA and CM at least twice a week.

4. Communicate in writing to the controls contractor all setpoint and parameter changes made or problems and discrepancies identified during TAB which affect the control system setup and operation.

5. Provide a draft TAB report within two weeks of completion.

6. Provide a final TAB report for the CA with details, as in the draft.

7. Conduct functional performance tests and checks on the original TAB as specified as requested by the CA.

H. Plumbing Contractors: The commissioning responsibilities applicable to the electrical contractor are as follows *(all references apply to commissioned equipment only)*:

1. Construction Phase

   a. Attend a commissioning scoping meeting and other necessary meetings scheduled by the CA to facilitate the Cx process.

   b. Contractors shall provide normal cut sheets and shop drawing submittals to the CM of commissioned equipment. CM will forward the CA a copy.

c. Provide additional requested documentation to the CA for development of start-up and functional testing procedures.

d. Provide labor in assistance to the CA in preparation of the specific functional performance test procedures. Subs shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.

e. Address current A/E punch list items before functional testing.

2. Acceptance Phase

a. Provide skilled technicians, the required test equipment, and miscellaneous equipment and materials to execute starting of equipment and to execute the functional performance tests.

b. Perform functional performance testing under the direction of the CA for specified equipment. Assist the CA in interpreting the monitoring data.

c. Correct deficiencies (differences between specified and observed performance and applicable Standards) as interpreted by the CA, CM and A/E and retest the equipment.

I. Electrical Contractors: The commissioning responsibilities applicable to the electrical contractor are as follows *(all references apply to commissioned equipment only)*:

1. Construction Phases

a. Attend a commissioning scoping meeting and other necessary meetings scheduled by the CA to facilitate the Cx process.

b. Contractors shall provide normal cut sheets and shop drawing submittals to the CM of commissioned equipment. CM will forward the CA a copy.

c. Provide additional requested documentation to the CA for development of start-up and functional testing procedures.

d. Provide labor in assistance to the CA in preparation of the specific functional performance test procedures. Subs shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.

e. Address current A/E punch list items before functional testing.

2. Acceptance Phase

a. Provide skilled technicians, the required test equipment, and miscellaneous equipment and materials to execute starting of equipment and to execute the functional performance tests.

b. Perform functional performance testing under the direction of the CA for specified equipment. Assist the CA in interpreting the monitoring data.

c. Correct deficiencies (differences between specified and observed performance and applicable Standards) as interpreted by the CA, CM and A/E and retest the equipment.

1.8 TESTING REQUIREMENTS

A. Specific functional testing requirements are listed for each system in Part 3 of this section. The Commissioning Authority (CA) shall develop step-by-step procedures to be executed by the Subs as directed by the Commissioning Authority.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. All standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the Division contractor for the equipment being tested. For example, the mechanical contractor shall be responsible for all standard testing equipment for the HVAC system and controls system except for equipment specific to and used by TAB in their commissioning responsibilities. Two-way radios shall be provided by the Division Controller.

B. Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be included in the base bid price to the Contractor and left on site.

C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the *Specifications.* Electrical test equipment shall meet the calibration requirements of the latest edition of NETA specifications.

PART 3 - EXECUTION

3.1 MEETINGS

A. Scoping Meeting

1. Within 30 days of commencement of construction, the CA will schedule, plan and conduct a commissioning scoping meeting with the entire commissioning team in attendance. A preliminary testing plan will be distributed to all parties by the CA.

B. Miscellaneous Meetings:

1. Two other meetings will be planned and conducted by the CA as construction progresses. These meetings will cover coordination, deficiency resolution and planning issues with particular Subs. The CA will schedule these meetings with the CM to be a part of the construction meeting and will minimize unnecessary time being spent by Subs.

3.2 SUBMITTALS

A. The Commissioning Authority will review and comment on all submittals related to the commissioned equipment to assist in the development of test procedures.

B. The CA may request additional design narrative from the A/E and Controls Contractor, depending on the completeness of the design intent documentation and sequences provided with the Specifications.

3.3 START-UP, PREFUNCTIONAL CHECKLISTS AND INITIAL CHECKOUT

A. General - The following procedures apply to all equipment to be commissioned:

1. Prefunctional checklists are important to ensure that the equipment and systems are hooked up and operational. It ensures that functional performance testing (in-depth system checkout) may proceed without unnecessary delays. Each piece of equipment receives full prefunctional checkout. The prefunctional testing for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system.

B. Start-up and Initial Checkout Plan:

1. The primary role of the CA in this process is to ensure that there is written documentation that each of the manufacturer-recommended procedures have been completed. Parties responsible for executing functional performance tests are identified in the testing requirements for each system.

2. The subcontractor responsible for the purchase of the equipment develops the full start-up plan by combining the manufacturer’s detailed start-up and checkout procedures from the O&M manual and the normally used field checkout sheets.

3. The subcontractor submits the full startup plan to the CA for review.

C. Execution of Prefunctional Checklists and Startup:

1. The CA shall review the checklists provided by the Contractor for each type of equipment to be commissioned.

2. The Subs and vendors shall execute startup and provide the CA with a signed and dated copy of the completed start-up and prefunctional tests and checklists.

D. Deficiencies, Non-Conformance and Approval in Checklists and Startup:

1. The Subs shall clearly list any outstanding items of the initial start-up and prefunctional procedures that were not completed successfully.

2. The CA reviews the report and submits either a non-compliance report or an approval form to the Sub or CM which indicates system is ready for functional testing.

3. Items left incomplete, which later cause deficiencies or delays during functional testing may result in backcharges to the responsible party.

3.4 FUNCTIONAL PERFORMANCE TESTING

A. This sub-section applies to all commissioning functional testing for all divisions.

B. The general list of equipment to be commissioned is found in this section.

C. The parties responsible to execute each test are listed with each test.

D. Objectives and Scope:

1. The objective of functional performance testing is to demonstrate that each system is operating according to the documented design intent and Contract Documents. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.

2. In general, each system should be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested.

E. Development of Test Procedures:

1. Before test procedures are written, the CA shall obtain all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters.

2. The CA shall develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Each Sub or vendor responsible to execute a test shall provide assistance to the CA in developing the procedures (answering questions about equipment, operation, sequences, etc.). Prior to execution, the CA shall provide a copy of the test procedures to the Sub(s) who shall review the tests for feasibility, safety, equipment and warranty.

F. Test Methods:

1. Functional performance testing and verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by stand-alone dataloggers.

2. Setup:
   a. Each function and test shall be performed under conditions that simulate actual conditions as close as is practically possible. The Sub executing the test shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the Sub shall return all affected building equipment and systems to their pre-test condition.

3. Sampling:
   a. The recommended sampling rates are specified with each type of equipment in the testing sections of this specification. It is noted that no sampling by Subs is allowed in prefunctional checklist execution.

G. Coordination and Scheduling:

1. The Subs shall provide sufficient notice to the CA and CM regarding their completion schedule for the prefunctional checklists and startup of all equipment and systems. The CA will schedule functional tests through the CM and affected Subs. The CA shall direct, witness and document the functional testing of all equipment and systems. The Subs shall execute the tests.

3.5 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS

A. Documentation:

1. The CA shall witness and document the results of all functional performance tests using the specific procedural forms developed for that purpose. Prior to testing, these forms are provided to the CM for review and approval and to the Subs for review.

B. Non-Conformance:

1. The CA will record the results of the functional test on the procedure or test form. All deficiencies or non-conformance issues shall be reported to the CM.

2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CA. In such cases the deficiency and resolution will be documented on the procedure form.

3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the CA will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues.

4. Cost of Retesting:

a. The cost for the *Sub* to retest a prefunctional or functional test, if they are responsible for the deficiency, shall be theirs. If they are not responsible, any cost recovery for retesting costs shall be negotiated with the CM.

b. The time for the CA and CM to direct any retesting required because a specific *prefunctional* checklist or start-up test item, reported to have been successfully completed, but determined during functional testing to be faulty, will be backcharged to the responsible contractor.

5. Any required retesting by any contractor shall not be considered a justified reason for a claim of delay or for a time extension by the prime contractor.

C. Approval:

1. The CA notes each satisfactorily demonstrated function on the test form. Formal approval of the functional test is made later after review by the CA and by the CM, if necessary. The CA recommends acceptance of each test to the CM using a standard form. The CM gives final approval on each test using the same form, providing a signed copy to the CA and the Contractor.

2. When functional testing of each system is approved by the CA, he/she will recommend to the CM and Owner that the system be considered substantially complete.

3.6 DEFERRED TESTING

A. Seasonal Testing:

1. During the Acceptance Phase, seasonal testing (tests delayed until weather conditions are closer to the system's design) shall be completed as part of this contract. The CA shall coordinate this activity with the CM. Tests will be executed, documented and deficiencies corrected by the appropriate Subs, with facilities staff and the CA witnessing. Any final adjustments to the O&M manuals and as-builts due to the testing will be made.

3.7 DOMESTIC HOT WATER HEATING SYSTEM TEST REQUIREMENTS

A. Parties Responsible to Execute Functional Test:

1. Plumbing Contractor: Operate the controls, as needed
2. CA: To witness, direct and document testing
3. Balancing Contractor to verify flows

B. Integral Components or Related Equipment Being Tested: Prefunctional tests must be complete for all of the components listed below prior to performing this functional test.

1. Domestic HW circulating pumps
2. Hot water boilers

C. Prerequisites:

1. None

D. Functions/Modes Required To Be Tested, Test Methods and Seasonal Test Requirements.

1. The following testing requirements are in addition to and do not replace any testing requirements elsewhere in this Specification.

Function / Mode	Test Method Manual, Monitoring, Either or Both	Required Seasonal Test[1]
General		
1. Temperature control of boiler at full load	Both	Heating
2. Control of hot water circulating pump(s)	Monitoring	Heating
3. Verify schedules and setpoints to be reasonable and appropriate	Monitoring	Both

[1]Cooling season, Heating season or Both. "Design" means within 5°of season design (ASHRAE 2 1/2%), or 95% of loading design. A blank cell denotes no special seasonal test is required and that test can be executed during any season, if condition simulation is appropriate.

E. Special Procedures (other equipment to test with, etc.; reference to function ID):

F. Acceptance Criteria (referenced by function or mode ID):

1. For the conditions, sequences and modes tested, the boilers, integral components and related equipment respond to varying loads and changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.

G. Sampling Strategy for Identical Units: No sampling, test all.

END OF REQUIREMENTS FOR HOT WATER HEATING SYSTEM TEST

3.8 VARIABLE VOLUME AIR HANDLING UNIT

A. Equipment to be tested
   1. AHU and associated VAV boxes, reheat coils and variable airflow sequences.

B. Parties Responsible to Execute Functional Test

   1. Controls Contractor: Operate the controls to activate the equipment.
   2. CA: To witness, direct and document testing.
   3. TAB Contractor to verify air and water flows.
   4. Mechanical Contractor to fix any problems.
   5. Unit Manufacturer's Representative.

C. Integral Components or Related Equipment Being Tested: Prefunctional tests must be complete for all of the components listed below prior to performing this functional test.

   1. Hot water heating system distribution to unit heating section
   2. VAV boxes, reheat coils and associated radiation (if applicable)
   3. VFDs
   4. Unit manufacturers packaged controls startup checklist and tests
   5. Communication interface between building control system and packaged controls including all point mapping and naming.

D. Prerequisites:

   1. The applicable prerequisite checklist items listed in Part 1 of this section and paragraph C above shall be listed on each functional test form and checked off prior to functional testing. The commissioning agent will also spot-check misc. items and calibrations on the prefunctional checklists previously completed by the installer, before the beginning of functional testing.

E. Functions/Modes Required To Be Tested, Test Methods :

   1. The following testing requirements are in addition to and do not replace any testing requirements elsewhere in this Specification.

Function / Mode	Test Method Manual, Monitoring, Either or Both[2]	Required Seasonal Test[1]
General 1. Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including startup, shutdown, unoccupied & manual modes and power failure.	Manual	
In addition to, or as part of (1) above, the following modes or tests are required:		
2. Hot water coil temperature control blend pump operation	Both	Heating
3. Economizer functions	Both	Cooling
4. SF, RF interlocks	Either	
5. Operation and staging of compressors	Both	Cooling

Function / Mode	Test Method Manual, Monitoring, Either or Both[2]	Required Seasonal Test[1]
6. Damper interlocks and correct modulation in all modes, including fire and smoke dampers.	Manual	
7. Temperature difference across heating and cooling coils	Manual	Both
8. Smoke detectors and smoke evac from fire alarm control panel.	Manual	
9. Verify TAB reported OA, SF and RF CFM with control system reading at minimum and maximum airflows.	Manual	
10. All alarms (low limits, high static, freezestat, etc.)	Manual	
11. Supply and return fans volume matching control	Monitoring	Design
12. CO2 demand ventilation control routine.	Monitoring	
13. Operation during occupied, unoccupied and warmup modes.	Manual	
14. Verify no hunting or significant overshoot by valves and dampers.	Monitoring	Both
15. Verify by measurement, HCV positive shutoff (no leak-thru)	Manual	
16. Sensor and actuator calibration checks on: SAT, MAT, OSAT, economizer and RA dampers and other random checks.	Manual	
17. Trend all temperature, air volume, pressure, fan speed and damper control points from the start of functional performance testing until Acceptance Phase is complete. Provide CA with all requested data.	Monitoring	Both
18. Supply and return fans static pressure and volume matching control	Monitoring	Design
19. VAV boxes occupied, unoccupied and warmup modes.	Manual	
20. Verify control parameters and setpoints to be reasonable and appropriate by reviewing the full program of each type of TU. Verify the max. and min. cfm setpoints of all tested TU's against the control drawing and TAB values. Verify other TU programming parameters such as K-factors, deadbands, setpoints, stroke times, etc.	Observation	

[1]Cooling season, Heating season or Both. "Design" means within 5°of season design (ASHRAE 2 1/2%), or 95% of loading design. A blank cell denotes no special seasonal test is required and that test can be executed during any season, if condition simulation is appropriate.
[2]Refer to Special Procedures

F. Special Procedures (other equipment to test with, etc.; reference to function ID): None

G. Acceptance Criteria (referenced by function or mode ID):

1. For the conditions, sequences and modes tested, the TU, integral components and related equipment respond to varying loads and changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.

2. Space temperature during occupied modes shall maintain specified tolerances without excessive hunting of the coil valve or complaints of drafts or stuffiness from occupants.

H. Sampling Strategy for Identical:
1. Perform 100% test of AHU and all associated components.
2. Perform 25% test of all VAV boxes and radiation (if installed) associated with each air handling unit.
3. Monitoring:
a. All rooms shall be monitored

END OF REQUIREMENTS FOR VARIABLE VOLUME UNIT TESTS

3.9 MAKEUP AIR UNIT

A. Equipment to be tested
1. Makeup air unit and associated fan, heating and cooling coils and sequences.

B. Parties Responsible to Execute Functional Test

1. Controls Contractor: Operate the controls to activate the equipment.
2. CA: To witness, direct and document testing.
3. TAB Contractor to verify air and water flows.
4. Mechanical Contractor to fix any problems.
5. Unit Manufacturer's Representative.

C. Integral Components or Related Equipment Being Tested: Prefunctional tests must be complete for all of the components listed below prior to performing this functional test.

1. Hot water heating system distribution to unit heating section
2. VFDs
3. Unit manufacturers packaged controls startup checklist and tests
4. Communication interface between building control system and packaged controls including all point mapping and naming.

D. Prerequisites:

1. The applicable prerequisite checklist items listed in the Part 1 of this section and paragraph C above shall be listed on each functional test form and checked off prior to functional testing. The commissioning agent will also spot-check misc. items and calibrations on the prefunctional checklists previously completed by the installer, before the beginning of functional testing.

E. Functions/Modes Required To Be Tested, Test Methods :

1. The following testing requirements are in addition to and do not replace any testing requirements elsewhere in this Specification.

Function / Mode	Test Method Manual, Monitoring, Either or Both[2]	Required Seasonal Test[1]
General 1. Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including startup, shutdown, unoccupied & manual modes and power failure.	Manual	
In addition to, or as part of (1) above, the following modes or tests are required:		
2. Hot water coil temperature control blend pump operation	Both	Heating
3. SF, RF interlocks	Either	
4. Damper interlocks and correct modulation in all modes, including fire and smoke dampers.	Manual	
5. Temperature difference across heating and cooling coils	Manual	Both
6. Smoke detectors and smoke evac from fire alarm control panel.	Manual	
7. Verify TAB reported OA, SF and RF CFM with control system reading at minimum and maximum airflows.	Manual	
8. All alarms (low limits, high static, freezestat, etc.)	Manual	
9. Operation during occupied, unoccupied and warmup modes.	Manual	
10. Verify control parameters and setpoints to be reasonable and appropriate. Verify the max. and min. cfm setpoints. Verify and record all packaged unit programming parameters.	Observation	
11. Verify proper operation in both cooling and heating modes under occupied and unoccupied conditions.	Both	Both
12. Verify no hunting or significant overshoot by valves and dampers.	Monitoring	Both
13. Verify by measurement, HCV positive shutoff (no leak-thru)	Manual	
14. Trend all temperature, air volume, pressure, fan speed and damper control points from the start of functional performance testing until Acceptance Phase is complete. Provide CA with all requested data.	Monitoring	Both
15. Verify control strategies, schedules and setpoints to be reasonable and appropriate		

Cooling season, Heating season or Both. "Design" means within 5°of season design (ASHRAE 2 1/2%), or 95% of loading design. A blank cell denotes no special seasonal test is required and that test can be executed during any season, if condition simulation is appropriate.
[2]Refer to Special Procedures

F. Special Procedures (other equipment to test with, etc.; reference to function ID): None

G. Acceptance Criteria (referenced by function or mode ID):

1. For the conditions, sequences and modes tested, the TU, integral components and related equipment respond to varying loads and changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.

2. Space temperature during occupied modes shall maintain specified tolerances without excessive hunting of the coil valve or complaints of drafts or stuffiness from occupants.

H. Sampling Strategy for Identical:
1. Perform 100% test of AHU and all associated components.
2. Monitoring:
a. All rooms shall be monitored

END OF REQUIREMENTS FOR MAKEUP AIR UNIT TESTS

3.10 MISCELLANEOUS EXHAUST FANS, HEATING & COOLING SYSTEMS

A. Equipment to be tested

1. Split DX systems
2. Cabinet Unit Heaters.
3. Exhaust fans
4. Gas Fired Radiant Heaters
5. Destratification Fans

B. Parties Responsible to Execute Functional Test

1. ATC Sub-subcontractor: Operate the controls to activate the equipment.
2. CA: To witness, direct and document testing.
3. TAB Sub-subcontractor to verify air and water flows.
4. HVAC Subcontractor to fix any problems.
5. Unit Manufacturer’s Representative.

C. Integral Components or Related Equipment Being Tested: Prefunctional tests must be complete for all of the components listed below prior to performing this functional test.

1. Split DX system
2. Hot water heating system
3. Exhaust Fans
4. Gas fired radiant heaters

D. Prerequisites:

1. The Contractor shall provide completed manufacturers startup checklists and complete system balancing report prior to the start of functional testing.

E. Functions/Modes Required To Be Tested, Test Methods :

1. The following testing requirements are in addition to and do not replace any testing requirements elsewhere in this Specification.

Function / Mode	Test Method Manual, Monitoring, Either or Both[2]	Required Seasonal Test[1]
General 1. Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including startup, shutdown, unoccupied & manual modes and power failure. Test functionality of each piece of equipment or system in all control strategies or interlocks that it is associated with.	Manual	
In addition to, or as part of (1) above, the following modes or tests are required:		
2. Hot water coil temperature control functions	Both	Heating
3. Temperature difference across heating coils	Manual	Both
4. All alarms (low limits, freezestat, compressor lockout, etc.)	Manual	
5. Occupied, unoccupied and warmup modes.	Manual	
6. Verify control parameters and setpoints to be reasonable and appropriate by reviewing the full program of each type of TU.	Observation	
7. Verify no hunting or significant overshoot by exhaust fan speeds, valves and dampers.	Monitoring	
8. Verify by measurement, HCV positive shutoff (no leak-thru)	Manual	
9. Trend all fan speed, temperature and valve control points from the start of functional performance testing until Acceptance Phase is complete. Provide CA with all requested data.	Monitoring	Both
10. Verify control strategies, schedules and setpoints to be reasonable.		

[1]Cooling season, Heating season or Both. "Design" means within 5°of season design (ASHRAE 2 1/2%), or 95% of loading design. A blank cell denotes no special seasonal test is required and that test can be executed during any season, if condition simulation is appropriate.
[2]Refer to Special Procedures

F. Special Procedures (other equipment to test with, etc.; reference to function ID): None

G. Acceptance Criteria (referenced by function or mode ID):

1. For the conditions, sequences and modes tested, the TU, integral components and related equipment respond to varying loads and changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.

2. Space temperature during occupied modes shall maintain specified tolerances without excessive hunting of the coil valve or complaints of drafts or stuffiness from occupants.

3. Exhaust fans and associated makeup air terminal units track to maintain spaces within specified parameters for temperature and pressure.

H. Sampling Strategy for Identical:

1. Test 100% of each type of terminal unit noted in this section.

2. Monitoring:

a. All rooms shall be monitored

- END OF REQUIREMENTS FOR MISCELLANEOUS HEATING & COOLING SYSTEMS TESTS -

3.11 HOT WATER HEATING SYSTEM TEST REQUIREMENTS

A. Parties Responsible to Execute Functional Test:

1. Controls Contractor: Operate the controls, as needed
2. HVAC mechanical contractor or vendor: Assist in testing sequences
3. CA: To witness, direct and document testing
4. Balancing Contractor to verify flows

B. Integral Components or Related Equipment Being Tested: Prefunctional tests must be complete for all of the components listed below prior to performing this functional test.

1. Building HW supply pumps
2. Hot water boilers

C. Prerequisites:

1. None

D. Functions/Modes Required To Be Tested, Test Methods and Seasonal Test Requirements.

1. The following testing requirements are in addition to and do not replace any testing requirements elsewhere in this Specification.

Function / Mode	Test Method Manual, Monitoring, Either or Both	Required Seasonal Test[1]
General		
1. Supply pump staging, bypass valve operation, HWT reset. Control of system differential pressure, verification of program settings,, alarms, etc.	Both	Heating
2. Constancy of differential pressure (pump control parameter)	Monitoring	Heating
3. Trend all temperature, differential pressure, speed and control points from the start of functional performance testing until Acceptance Phase is complete.	Monitoring	Both

Function / Mode	Test Method Manual, Monitoring, Either or Both	Required Seasonal Test[1]
4. Verify schedules and setpoints to be reasonable and appropriate		
5.		

[1]Cooling season, Heating season or Both. "Design" means within 5°of season design (ASHRAE 2 1/2%), or 95% of loading design. A blank cell denotes no special seasonal test is required and that test can be executed during any season, if condition simulation is appropriate.

E. Special Procedures (other equipment to test with, etc.; reference to function ID):

F. Acceptance Criteria (referenced by function or mode ID):

1. For the conditions, sequences and modes tested, the boilers, integral components and related equipment respond to varying loads and changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.

G. Sampling Strategy for Identical Units: No sampling, test all.

END OF REQUIREMENTS FOR HOT WATER HEATING SYSTEM TEST

3.12 TEST AND BALANCE WORK (TAB) TEST REQUIREMENTS

A. Parties Responsible to Execute Functional Test:

1. TAB Contractor: Perform checks using test instruments.
2. Controls Contractor: Operate the controls to activate the equipment.
3. CA: To witness, direct and document testing.
4. Mechanical Contractor to assist in accessing or fixing equipment.

B. Integral Components or Related Equipment Being Tested: Prefunctional tests must be complete for all of the components listed below prior to performing this functional test.

1. TAB water-side
2. TAB air-side
3. TAB equipment and systems

C. Prerequisites

1. Completed (Typed) Testing, Adjusting and Balancing Report stamped by the responsible certified balancing contractor.

D. Purpose:

1. The purpose of this test is to spot check the TAB work to verify that it was done in accordance with the contract documents and acceptable practice and that the TAB report is accurate.

E. The following tests and checks will be conducted. The following testing requirements are in addition to and do not replace any testing requirements elsewhere in this Specification.

Test or Check	Test Method	Required Seasonal Test[3]
1. A random sample of up to 20 % of the TAB report data shall be selected for verification (air velocity, air or water flow rate, pressure differential, electrical measurement, etc.). The original TAB contractor will execute the checks, witnessed by the commissioning authority. The controls contractor will demonstrate that flow readings match (within the range specified) those read by the balancer. The TAB contractor will use the same test instruments as used in the original TAB work.	Demonstration	
2. Verify that final settings of all valves, splitters, dampers and other adjustment devices have been permanently marked by the TAB Contractor.	Demonstration	
3. Verification that the air system is being controlled to the lowest possible airflow while still meeting design loads and minimum flow requirements for unit DX coil.	Demonstration	
4. Verification that the water system is being controlled to the lowest possible pressure while still meeting design loads, less diversity. This shall include a review of TAB methods, control setpoints established by TAB and a physical verification of at least one leg from the pump to the coil having all balancing valves wide open and that during a call for full heating that at least one valve is wide open in the longest leg.	Demonstration	

All readings shall be within 10% of the values shown on the balancing report

F. Special Procedures (other equipment to test with, etc.; reference to function ID): None

G. Required Monitoring: None

H. Acceptance Criteria (referenced by function or mode ID): Provided in footnote to test table above.

1. Sampling Strategy for Identical Units: Described in test table above.

END OF REQUIREMENTS FOR TAB TEST

3.13 LIGHTING CONTROL SYSTEM TEST REQUIREMENTS

A. Parties Responsible to Execute Functional Test:

1. Electrical Contractor
2. Electrical control system manufacturers' rep (if applicable)
3. CA: To witness, direct and document testing

B. Integral Components or Related Equipment Being Tested: Prefunctional tests must be complete for all of the components listed below prior to performing this functional test.

1. Occupancy sensors for lighting
2. Light Timer control panel

C. Prerequisites:

1. The applicable prerequisite checklist items listed in Part 1 of this section and paragraph B above shall be listed on each functional test form and checked off prior to functional testing. The commissioning agent will also spot-check misc. items and calibrations on the prefunctional checklists previously completed by the installer, before the beginning of functional testing.

D. Functions/Modes Required To Be Tested, Test Methods:

1. The following testing requirements are in addition to and do not replace any testing requirements elsewhere in this Specification.

Function / Mode	Test Method Manual, Monitoring, Either or Both	Required Seasonal Test
General 1. Test all manual controls individually.	Manual	
2. Demonstrate all automatic functions using manual control overrides.		
3. Demonstrate all interlocking functions, i.e., security/fire alarm.		

E. Acceptance Criteria

1. Acceptance is achieved when all functions of the specified system have been demonstrated.
2. Verify that minimum specified light levels are maintained under all conditions.

F. Sample strategy for identical units: Demonstrate a random sample of 25% of each type of installation.

END OF REQUIREMENTS FOR LIGHTING CONTROL SYSTEM TEST

3.14 WRITTEN WORK PRODUCTS

A. The commissioning process generates a number of written work products described in the *Specifications*. Below is a list of all the formal written work products and who is responsible to create them. In summary, the written products are:

Product		Developed By
1.	Meeting minutes	CA
2.	Commissioning schedules	CA with CM
3.	Equipment documentation submittals	Subs
4.	Sequence clarifications	Subs and A/E as needed
5.	Prefunctional checklists	Subs
6.	Startup and initial checkout plan	Subs
7.	Prefunctional documentation checklists	Subs
8.		
9.	Deficiency reports	CA
10.	Preliminary commissioning report	CA
11.	Functional tests	CA
12.	Final Commissioning Report	CA

- END OF SECTION -

SECTION 02 32 19 - EXPLORATORY EXCAVATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This section includes the requirements for the excavation and backfilling of test pits for the purpose of determining the exact location of underground utilities, pipes, conduits and encasements. The Contractor shall furnish all labor, equipment and materials to perform this work. Hereinafter, these subsurface features are referred to as utilities.

1.2 REFERENCED SECTIONS

A. Section 02 61 13 Excavation, Removal, and Handling of Contaminated Material

B. Section 31 23 00 Excavation and Fill

1.3 CITED STANDARDS

A. Comply with OSHA Requirements for temporary support of excavations.

B. Comply with NYS Industrial Code 53 before excavating.

1.4 NOTED RESTRICTIONS

A. The test pits required or needed shall be taken at locations identified by the Engineer or selected by the Contractor and approved by the Engineer.

B. Once the pavement surface is scraped away, all excavation shall be hand excavation.

C. If test pits are near active roadways, proper drop-off protection shall be incorporated to the satisfaction of the Engineer. Test pits shall be backfilled as soon as all information is obtained.

D. If work is within the local streets, the Contractor shall coordinate and obtain permits from the local municipality. The Contractor shall comply with the permit and restore any pavement disturbed by the operation.

1.5 QUALITY CONTROL

A. (None listed)

1.6 SUBMITTALS

A. The contractor shall submit sketches showing the location of subsurface features that were uncovered in the test pit, including the following information:

1. Horizontal location of utility relative to three individual surface features

2. Depth of feature below surface

3. Elevation of feature

4. Survey coordinate of feature

5. Diameter, type and condition of pipe or conduit

6. Orientation of pipe, conduit or structure relative to other site features

7. Test pit identification number

8. Type of Utility

1.7 DELIVERABLES

A. Perform test pits within the limits of work or area of disturbance, easements and right of way, and local street as approved by the Engineer.

PART 2 PRODUCTS

2.1 MATERIALS

A. Asphalt pavement shall meet the requirements of NYSDOT Standard Specification Section 608-2.

PART 3 EXECUTION

3.1 PREPARATION

A. Coordinate with third party personnel, including Code 53, private utility companies, and local municipalities.

B. Provide maintenance and protection of traffic and pedestrian measures as appropriate and to the satisfaction of the Engineer.

C. Dig test pits in advance of the construction in locations shown on the drawings and as ordered by Engineer. Determine exact locations and obtain the required information.

D. Upon the receipt of the test pit data, the Engineer may alter the proposed installations to avoid conflicts. No additional payment will be made to the Contractor as a result of any necessary alterations.

E. Backfill test pits in accordance with Section 31 23 00. If surface is to be used by public vehicles or pedestrians before the full proposed work is completed, pave the test pits with 3" asphalt as per NYSDOT Standard Specification Section 608-3. If test pit is located on a local road or station access road, sawcut a neat, edge line, comply with the local standards, match existing pavement depths, but in no cases shall less than 3" of asphalt be used.

F. When pavement is present, paint the location information of the existing utilities found at the test pit location. When pavement is not present, the Contractor shall place, protect and restore as~~t~~ needed markers that located the existing utilities.

END OF SECTION

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SECTION 02 41 13.23 - UTILITY LINE REMOVAL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Requirements for removal, disposal and abandonment of existing facilities within the limits of work or as specified in the contract documents, including:

1. Foundations
2. Overhead and underground utilities
3. Abandoned wiring
4. Light Poles
5. Drainage structures
6. Other items for removal or demolition as indicated on the Contract Documents or as required for completion of the proposed improvements

B. Work shall include providing all labor, materials and equipment to perform the demolition, removal and disposal work as per the Contract Documents.

1.2 REFERENCED SECTIONS

A.	Section 02 32 19	Exploratory Excavations
B.	Section 31 23 00	Excavation and Fill
C.	Section 31 25 00	Soil Erosion and Sedimentation Controls
D.	Section 02 61 13	Excavation, Removal and Handling of Contaminated Material

1.3 CITED STANDARDS

A. New York State Department of Environmental Conservation

B.	6NYCRR	Part 360	Solid Waste Management Facilities
C.	6NYCRR	Parts 371-376	Hazardous Waste Management Regulations

D. Code of Federal Regulations

E.	29 CFR	Part 1926.62	Safety and Health Regulations for Construction

1.4 NOTED RESTRICTIONS

A. (None noted)

1.5 QUALITY CONTROL

A. No on-site sale of removed materials shall be permitted.

B. Use of explosives is prohibited; blasting shall not be permitted.

C. Maintain site drainage and control erosion during removal of existing drainage and utility lines.

1.6 SUBMITTALS

A. Copies of required permits.

B. Complete description of proposed methods, procedures and equipment.

1.7 DELIVERABLES

A. (None listed)

PART 2 PRODUCTS

2.1 MATERIALS

A. (Not Used)

PART 3 EXECUTION

3.1 PREPARATION

A. Transmit submittals required by this Section.

B. Inspect existing conditions and note dimensions, clearances, access, utilities, shoring, and protection required.

C. Implement Industrial Code 753 and contact “Call Before You Dig” to request stakeout of existing utilities. Also request stakeout of existing facility utilities from the Owner. Obtain utility shut-offs to safely execute the work.

D. Verify that structures to be removed are cleared of occupants, supplies and utilities.

E. Provide temporary construction for the maintenance, support and protection of existing adjacent structures, facilities, and utilities that are to remain.

F. Coordinate operations with Engineer prior to starting work.

G. Provide soil erosion measures to protect existing catch basins to remain and to prevent

movement of soils.

3.2 DEMOLITION

A. Relocations:

1. Relocate existing utilities as necessary. Coordinate with Engineer, Owner and the appropriate utility company. If utility agencies are to relocate or install facilities with their own forces, the Contractor shall coordinate with them, provide support work as required, and pay all fees associated with the relocations / installations. Maintain service as required by the Owner during relocations.

2. Temporary service may be required during the relocation of existing utilities. The Contractor shall notify the Owner, utility company, and Engineer to develop a plan for the location of the temporary utility line(s).

a. These items shall be carefully taken apart and relocated to the new locations so that they are completely functioning as they were at the start of the contract.

(1) If unforeseen obstructions are encountered, obtain instructions from the Engineer and the Owner before proceeding with the work.

B. Removals:

1. Remove existing facilities as indicated or necessary. If utility agencies are to remove facilities with their own forces, the Contractor shall coordinate with them, provide support work as required, and pay all fees associated with the removals.

2. If unforeseen obstructions are encountered, obtain instructions from the Engineer and the Owner before proceeding with the work.

3. Promptly repair, restore or replace any damage, disturbance or impairment of existing facilities or structures to remain.

4. Wet masonry and concrete materials during demolition to prevent spread of dust and dirt. Do not use water in a manner that will cause damage or contaminated runoff or icing. Perform operations to control erosion within and adjacent to right-of-way.

5. Fill and compact below grade areas and voids resulting from removal of below-grade structures and utilities.

6. Abandon conduit or remove if it interferes with proposed work. Remove wiring to the source of supply.

7. Maintain access to existing electrical, communications or signal systems that are to remain.

8. Remove and legally dispose of abandoned luminaries, poles, foundations, supporting brackets, wire/cable, cabinets and other accessories. All wire/cable in conduit to be abandoned shall be removed. Comply with latest National Electric Code with respect to electrical removals and relocations.

C. Disposal:

1. Keep the project area clear of all refuse and rubbish; maintain the area in a neat condition.

2. Do not dump or place material designated for disposal within the limits of any public street or road or stockpile on the Owner property unless approved in writing by the Owner.

D. Abandonment

1. Only utility and drainage pipes that are specifically indicated for abandonment on the plans can be abandoned and only if they do not interfere with the proposed work. If portions of the line interfere with the proposed work, that portion shall be removed at no additional cost to the Owner or contract.

2. Utility pipes to be abandoned that are less than 12” in diameter and in the work area shall be plugged with cement conforming to Section 701-02 of NYSDOT Standard Specifications.

3. Utility pipes to be abandoned that are 12” or greater in diameter and in the work area shall be removed if there is a conflict with the proposed work, as directed by the Owner. If there is no conflict with the work, the utility pipe shall be filled with lean concrete based mix without stones or sand slurry. The pipes shall be bulkheaded with block mortar. The bulkhead shall be equal to the diameter of the pipe, but exceed 2’-0, and with standpipes and vent pipes installed to completely fill the pipe by pumping the grout mix into the pipe for the length required. The grout mix shall be pumped with a maximum compressive strength of 800 PSI. Submit the proposed concrete mix for approval prior to installation.

3.3 SPECIAL CONDITIONS

A. Conduct operations and maintain the project site to minimize creation and dispersion of dust throughout period of demolition.

B. Employ control measures, generally as follows:

1. Apply water a minimum of once per day and more often as needed to prevent dust.

2. Apply water with equipment consisting of tank, pump with discharge gauge, hoses and mist nozzles.

3. Keep areas damp without creating nuisance conditions.

4. Provide water that is free of salt, oil and other deleterious materials.

C. Notify the Owner immediately if any historic-period archaeological resources are identified.

D. Catch basin and manhole sediment shall be disposed of off-site and be done in accordance with applicable codes and laws.

END OF SECTION

SECTION 02 61 13
EXCAVATION, REMOVAL AND HANDLING OF CONTAMINATED MATERIAL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. The work under this section shall consist of furnishing all labor, equipment and materials for performing all operations for excavation of non-hazardous contaminated material as described in the following reports:

1. Hazmat Investigation Report, and/or

2. Environmental Assessment Report

1.2 REFERENCED SECTIONS

A. 02 32 19 Exploratory Excavation

B. 31 23 00 Excavation and Fill

1.3 CITED STANDARDS

A. Title 29 Code of Federal Regulations, Part 1926, Safety and Health Regulations for Construction (OSHA)

B. Title 40 Code of Federal Regulations, Parts 260—263, United States Environmental Protection Agency Resource Conservation and Recovery Act (RCRA)

C. New York State Department of Environmental Conservation Division of Environmental Remediation, Technical Guidance for Site Investigation and Remediation (DER-10)

D. New York State Department of Environmental Conservation Title 6, Rules and Regulations of the State of New York (6 NYCRR) Part 375

1.4 NOTED RESTRICTIONS

A. Permits and Regulations

1. The Contractor shall prepare all submittals and obtain all necessary permits and approvals to complete the Work. The Contractor shall also obtain permits and approvals, pay all fees, and maintain all insurance required by federal, state and local agencies.

2. The Contractor shall perform all Work in strict compliance with all applicable requirements of governing and public agencies and federal, state and local authorities having jurisdiction.

3. The Contractor is advised that all excavation work performed shall be in strict compliance with Occupational Safety and Health Administration (OSHA), Title

29, Code of Federal Regulations 1926, and all other applicable state and federal regulations.

4. The Contractor shall perform post excavation confirmatory soil sampling of contaminated material in accordance with New York State Department of Environmental Conservation DER-10, Technical Guidance for Site Investigation and Remediation.

5. The Contractor shall provide all required notifications to federal, state and local agencies prior to the Work. Copies of all notifications shall be transmitted to the Owner at the time of issuance.

B. Existing Conditions

1. The Contractor shall review the information regarding the contaminant concentrations at the site in the following reports:

a. Hazmat Investigation Report and/or

b. Environmental Assessment Report

1.5 QUALITY CONTROL

A. The Contractor shall coordinate the work with the Engineer to allow access to collect any samples (i.e., waste classification, post-excavation, etc.), or perform any testing, as necessary.

1.6 SUBMITTALS

A. The Contractor shall prepare and submit as part of the Construction Plan, a section describing the planned excavation activities, to the Engineer for review and approval. The excavation section of the Construction Plan shall include a description of the work required in this specification section, the sequencing and scheduling, including: the excavation methods (i.e., open sloped cut, sheeted/shored vertical sidewalls, sloping/benching and/or shoring/bracing methods, sheet piling, temporary support system, roll-off support system, etc.) vapor/odor control techniques, proposed temporary staging areas, management of excavated materials, post-excavation confirmatory soil sampling, proposed truck weighing method, and any permit requirements. The excavation section of the Construction Plan shall also include copies of required notifications and permits obtained by the Contractor, a list of all subcontractors and copies of their current, valid permits or licenses to perform the work. Work shall not begin until approval is received from the Engineer.

PART 2 PRODUCTS

A. (Not used)

PART 3 EXECUTION

3.1 GENERAL

A. The Contractor shall excavate material to the limits shown on the Contract Drawings and in accordance with the requirements of this section and as specified in Section 31 23 00 Excavation and Fill and in 02 32 19 Exploratory Excavation.

B. Excavation equipment and waste storage containers shall be selected by the Contractor and shall be satisfactory for completing the work in accordance with the Specifications.

C. The Contractor shall coordinate access to the excavations with the Engineer and shall provide assistance as needed for inspections of the excavation areas.

D. The Contractor shall maintain a map documenting the daily cumulative horizontal and vertical extent of the excavation in each area including quantities. The map shall be updated daily and posted in the Contractor's trailer.

E. Any subsurface structures or debris located within the limits of the excavations shall be removed, cleaned, as necessary, and segregated for final disposition.

F. Any utilities and associated structures encountered within the excavations shall be addressed on a case by case basis with the Contractor, the Engineer and the utility owner.

3.2 SHEETING, SHORING AND BRACING

A. Excavation in close proximity to active utilities or aboveground structures shall be done in a manner protective of the utility or structure, such as using sheeting and shoring. The Contractor shall protect all existing structures and utilities. All repairs shall be done at the Contractor's expense.

B. The Contractor shall perform all work in accordance with OSHA Standards.

C. The Contractor shall perform excavation of soil to the horizontal and vertical limits shown on the Contract Drawings. During excavation activities, the actual horizontal and vertical bounds of the final excavated area shall be documented by the Contractor.

D. All earthwork equipment and tools used for excavation of contaminated soil shall be cleaned in accordance with the Contractor's Health and Safety Plan, and these specifications prior to being used elsewhere on-site or before leaving the Site.

E. The excavation shall be kept free of standing water by installation of a diversion ditch, as needed, to prevent surface water run-on.

F. The Contractor shall not be permitted to backfill the excavation until the final limits of excavation are reviewed and approved by the Engineer.

G. Upon direction from the Engineer, the Contractor may place grade and compact remaining fill to lines and grades as shown on the Contract Drawings.

H. The Contractor shall have contingency measures in place if additional excavation is necessary, as determined by Engineer, below lines and grades as shown on the Contract Drawings. Contingency measures shall include removal and stockpiling of 12 inches of loose fill material during additional excavation.

3.3 CONTAMINATED MATERIAL STORAGE

A. When approved by the Engineer, the Contractor shall transport contaminated soil to the stockpiling area for temporary storage of contaminated soil. Stockpiles of contaminated soil shall be placed on a polyethylene sheeting with a minimum thickness of 6-mil. The stockpile area shall be free of sharp objects, boulders, stumps or any materials that may contribute to punctures, shearing, rupturing or tearing. The temporary stockpile shall be maintained at a slope of not steeper than 1V:2.5H except when approved by the Engineer.

B. Impervious polyethylene sheeting with minimum thickness of 6-mil shall be used as a daily cover on the stockpile to prevent potential contaminated runoff and minimize dust generation. Sand bags shall be used to hold the cover firmly in place. The polyethylene sheeting shall be laid smooth and free of tension, stress, folds, wrinkles or creases. The Contractor shall overlap sections a minimum of 12 inches when placing polyethylene sheeting. Any polyethylene sheeting damaged during the installation or thereafter shall be repaired or replaced at the discretion of the Contractor and not at additional cost to the Owner.

C. Sheeting, shoring and bracing to be designed by the engineer engaged by the Contractor shall take into account the load from any soil stockpile staged adjacent to the lateral support structure.

D. Contractor shall design and implement appropriate shoring/bracing procedures for safe excavation and to comply with OSHA regulations. The shoring/bracing system shall be implemented in accordance with the design to be proposed by the Contractor. This design shall be signed and sealed by a Professional Engineer licensed to practice in the State of New York and reviewed and accepted by the Owner's Engineer.

E. The Contractor shall be responsible for proper on-site management of wastes generated in compliance with all federal, state and local regulations. All off-site transportation and disposal of waste shall be in accordance with all federal, state and local regulations. Containers provided shall meet all applicable requirements.

F. Upon completion of sampling and testing, the stockpiled material shall be loaded directly into containers (e.g., roll-off container, dump trailers, etc.) provided by the Contractor for off-site disposal. The containers provided shall be approved by Engineer, and capable of containing fluids that could potentially drain from the excavated soil, and have a cover that forms a seal to encapsulate the contained material.

G. Once loaded, the Contractor shall cover the container prior to leaving the work area. Filled containers shall then be moved from the work area and brought immediately to the decontamination pad.

H. Subject to the approval of the Engineer, and prior to leaving the site, vehicles and equipment that come in contact with contaminated soil shall be decontaminated. All equipment used for excavation and other earthwork activities shall be decontaminated prior to crossing areas of the site which do not require remediation or have already been remediated, handling clean fill materials, and leaving the site.

I. The Contractor shall prepare and provide the Engineer with complete records for each

shipment stating description of materials, weight or volume of contents, source and final destination. In addition, the Contractor shall provide for the Engineer's approval, a decontamination certificate for each shipment prior to leaving the site stating that:

1. No soil or other residue is adhering to the vehicle body, under carriage or tires.

2. The vehicle is not leaking or allowing particles to become airborne.

3. The contents of the vehicle are covered or are completely enclosed so as to not permit potentially fugitive particulate matter to become airborne.

J. The Contractor shall be responsible for obtaining all applicable permits and authorizations necessary to use the haul routes for transportation.

K. The Contractor shall be responsible to inspect the transportation vehicles and containers before and after loading to ensure compliance with all Local, State and Federal regulations for the safe transport of wastes from the Site to the appropriate treatment/disposal facility. The Contractor shall provide the necessary labor and materials to insure all containers (e.g., dump trailers, roll-off containers, etc.) and vehicles are prepared for off-site transportation (i.e., covered containers, cleaned containers and vehicles, material is stabilized with no free liquid) in accordance with the applicable federal, state and local regulations prior to departure.

L. The Contractor shall inspect each container to ensure that soil shipped off-site for disposal does not contain standing water to the satisfaction of the Engineer.

M. The Contractor shall coordinate with the Engineer to insure that the transporters arriving at the site for loading do not cause undue congestion to local streets, and shall stage trucks either within the perimeter of the site or at an off-site staging area designated by the Engineer.

N. The Contractor's transporters shall proceed directly from the Site to the appropriate designated treatment/disposal facility. Temporary staging or storage of material at intermediate locations between the site and the receiving facility is prohibited. The Contractor shall immediately notify the Engineer of any emergencies that occur during transportation (*e.g.,* extended delays, break-downs, etc.).

O. The Contractor will not be permitted to redistribute or reuse excavated contaminated soil as backfill.

P. Contractor shall organize, maintain, and provide the Engineer with a copy of each executed Bill of Lading/Non-Hazardous Waste Manifest for all loads shipped off-site, as required. In addition, the Contractor shall provide to the Engineer, documentation and records verifying receipt of each truck-load by the receiving facility. Such documentation will indicate the weight of each load shipped with certified weight scale receipt.

Q. The Contractor shall be responsible for all spills and cleanup thereof in loading, transit and unloading.

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SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Foundations and footings including column piers and grade beams.
2. Retaining walls.
3. Slabs-on-grade.
4. Suspended slabs.
5. Concrete toppings, washes and pourstrips.
6. Stairs, landings and lobby floors.
7. Stair tower and elevator walls.
8. Building frame members.
9. Building walls.
10. Equipment pads and bases.

B. Related Sections include the following:
1. Division 3 Section "Precast Concrete" for plant cast concrete.
2. Division 7 Section "Garage Waterproofing Systems" for waterproofing applied to cast-in-place concrete.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

1.5 INFORMATION SUBMITTALS

A. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.

1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and installing and removing reshoring.

B. Samples: For waterstops and vapor retarder.

C. Welding certificates.

D. Qualification Data: For Installer, manufacturer and testing agency.

E. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures, including compatibility certification.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Fiber reinforcement.
6. Waterstops.
7. Curing compounds.
8. Floor and slab treatments.
9. Bonding agents.
10. Adhesives.
11. Vapor retarders.
12. Semirigid joint filler.
13. Joint-filler strips.
14. Repair materials.

F. Material Test Reports: For the following, from a qualified testing agency:

1. Aggregates.

G. Field quality-control test and inspection reports.

H. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. 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.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.

2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

E. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."

F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

H. Mockups: Cast concrete slab-on-grade, toppings, washes, pourstrips and formed-surface panels to demonstrate reinforcement placement, typical joints, surface finish, texture, tolerances, and standard of workmanship.

1. Build panel approximately 200 sq. ft. for slab-on-grade, 100 sq. ft. for slabs/topping at supported levels, and 100 sq. ft. for formed surface in the location indicated or, if not indicated, as directed by Architect.

2. Approved panels may become part of the completed Work if undisturbed at time of Substantial Completion.

I. Preinstallation Conference: At least 30 days prior to the start of concrete work, conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1. Review proposed concrete design mixtures and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

    a. Contractor's superintendent.
    b. Independent testing agency responsible for concrete design mixtures.
    c. Independent testing agency responsible for field quality control.
    d. Ready-mix concrete manufacturer.
    e. Concrete subcontractor.
    f. Primary admixture manufacturers.

    Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab finish requirements, concrete repair procedures, and concrete protection.

2. Minutes of the meeting shall be recorded and prepared by the Contractor and distributed to all parties concerned within 5 days of the meeting.

    a. The minutes shall include a statement by the concrete subcontractor indicating that the proposed design mixtures and their placing, consolidating, finishing and curing procedures can produce the concrete quality required by the specifications.

J. For the purposes of this Specification, all concrete within the parking structure is considered to be "exposed to public view." Where the concrete surface is indicated to have an "Architectural Concrete Finish", the contactor shall adhere to the requirements as defined in Paragraph 3.10.D. of this Section.

K. The Contractor shall keep the following references at the project site:

1. ACI 301 (latest edition) "Specification for Structural Concrete for Buildings."
2. ACI 305R "Hot Weather Concreting."
3. ACI 306.1 "Cold Weather Concreting."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Products: Subject to compliance with requirements, provide one of the products specified.
3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706, Grade 60, deformed.

C. Stainless-Steel Reinforcing Bars: ASTM A 955, Grade 60, Type 304, deformed.

D. Steel Bar Mats: ASTM A 184, fabricated from ASTM A 615, Grade 60, deformed bars, assembled with clips.

E. Carbon Steel Wire and Welded Wire Reinforcement, Plain and Deformed: ASTM A 1064, Grade 65

2.4 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs.

B. 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," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.5 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I. Use one brand of cement throughout Project unless otherwise acceptable to Architect. When permitted, supplement with the following:

   a. Fly Ash: ASTM C 618, Class F.
   b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

2. See Paragraph 2.13.B. for limitation of use for supplementary cementitious materials.

B. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
2. Fine Aggregate: ASTM C 1260, Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

2.6 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. 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, Type A.
2. Retarding Admixture: ASTM C 494, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.

C. Non-Set-Accelerating Calcium Nitrite Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

1. Available Products:

a. Grace Construction Products, W. R. Grace & Co.; DCI-S.
b. Euclid Chemical Company (The); Eucon CIA (with appropriate retarder as required).
c. OR approved equal.

2. Add three (3) gallons per cu. yd. of concrete in cast-in-place beams, slabs, toppings, washes, and pourstrips.

2.7 FIBER REINFORCEMENT

A. Synthetic Fiber: Monofilament or fibrillated polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inches long.

1. Available Products:

a. Monofilament Fibers:

1) Axim Concrete Technologies; Fibrasol IIP.
2) Euclid Chemical Company (The); Fiberstrand 100.
3) FORTA Corporation; Forta Mighty Mono.
4) Grace Construction Products, W. R. Grace & Co.; Grace MicroFiber.
5) Metalcrete Industries; Polystrand 1000.
6) SI Concrete Systems; Fibermesh 150.

2.8 WATERSTOPS

A. Flexible Rubber Waterstops: CE CRD-C 513, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Available Manufacturers:

   a. Greenstreak.
   b. Progress Unlimited, Inc.
   c. Williams Products, Inc.

2. Profile: Ribbed with center bulb.
3. Dimensions: Size to suit application; non-tapered.

B. Flexible PVC Waterstops: CE CRD-C 572, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Available Manufacturers:

   a. Bometals, Inc.
   b. Greenstreak.
   c. Meadows, W. R., Inc.
   d. Murphy, Paul Plastics Co.
   e. Progress Unlimited, Inc.
   f. Vinylex Corp.

2. Profile: Ribbed with center bulb.
3. Dimensions: Size to suit application; non-tapered.

2.9 VAPOR RETARDERS

A. Plastic Vapor Retarder: ASTM E 1745, Class A, not less than 15 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.

1. Available Products:

   a. Fortifiber Corporation; Moistop Plus.
   b. Raven Industries Inc.; Dura Skrim 6.
   c. Reef Industries, Inc.; Griffolyn Type-65.
   d. Stego Industries, LLC; Stego Wrap, 15 mils.
   e. W.R. Meadows, Inc.; Perminator, 15 mils.

B. Bituminous Vapor Retarder: 110-mil-thick, semiflexible, 7-ply sheet membrane consisting of reinforced core and carrier sheet with fortified asphalt layers, protective weathercoating, and removable plastic release liner. Furnish manufacturer's accessories including bonding asphalt, pointing mastics, and self-adhering joint tape.

1. Product: W. R. Meadows, Inc.; Premoulded Membrane Vapor Seal.

2. Water-Vapor Permeance: 0.00 grains/h x sq. ft. x inches Hg; ASTM E 154.
3. Tensile Strength: 140 lbf/in.; ASTM E 154.
4. Puncture Resistance: 90 lbf; ASTM E 154.

C. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

D. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a 3/8-inch sieve, 10 to 30 percent passing a No. 100 sieve, and at least 5 percent passing No. 200 sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

2.10 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

1. Available Products:

a. Axim Concrete Technologies; Cimfilm.
b. Burke by Edoco; BurkeFilm.
c. ChemMasters; Spray-Film.
d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Aquafilm.
e. Dayton Superior Corporation; Sure Film.
f. Euclid Chemical Company (The); Eucobar.
g. Kaufman Products, Inc.; Vapor Aid.
h. Lambert Corporation; Lambco Skin.
i. L&M Construction Chemicals, Inc.; E-Con.
j. MBT Protection and Repair, Div. of ChemRex; Confilm.
k. Meadows, W. R., Inc.; Sealtight Evapre.
l. Metalcrete Industries; Waterhold.
m. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
n. Sika Corporation, Inc.; SikaFilm.
o. Symons Corporation, a Dayton Superior Company; Finishing Aid.
p. Unitex; Pro-Film.
q. US Mix Products Company; US Spec Monofilm ER.
r. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

1. Available Products:

    a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
    b. Burke by Edoco; Aqua Resin Cure.
    c. ChemMasters; Safe-Cure Clear.
    d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; W.B. Resin Cure.
    e. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
    f. Euclid Chemical Company (The); Kurez DR VOX.
    g. Kaufman Products, Inc.; Thinfilm 420.
    h. Lambert Corporation; Aqua Kure-Clear.
    i. L&M Construction Chemicals, Inc.; L&M Cure W.
    j. Meadows, W. R., Inc.; 1100 Clear.
    k. Nox-Crete Products Group, Kinsman Corporation; Resin Cure E.
    l. Symons Corporation, a Dayton Superior Company; Resi-Chem Clear Cure.
    m. Tamms Industries, Inc.; Horncure WB 30.
    n. Unitex; Hydro Cure 309.
    o. US Mix Products Company; US Spec Maxcure Resin Clear.
    p. Vexcon Chemicals, Inc.; Starseal 1315.

2.11 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 or aromatic polyurea with a Type A shore durometer hardness range of 90 to 95 per ASTM D 2240.

C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

    1. Types I and II, non-load bearing or IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.12 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

    1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
    2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.

3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4000 psi at 28 days when tested according to ASTM C 109.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109.

2.13 CONCRETE MIXTURES, GENERAL

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.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Use of supplementary cementitious materials will be permitted in footings, pile caps, column piers, retaining walls and grade beams only. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.
2. Combined Fly Ash and Pozzolan: 25 percent.
3. Ground Granulated Blast-Furnace Slag: 50 percent.
4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
5. The exact percentages of supplementary cementitious materials used shall be based on successful placement onsite. If weather or other conditions affect the concrete properties, finishing, curing, etc. the contractor shall adjust the mix as required and resubmit for approval.
6. In mass concrete of more than 2 feet thick, the usage rate may be increased up to 50% for fly ash and 80% for slag as long as all other requirements are met.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent for prestressed or post-tensioned concrete and 0.15 percent for mildly reinforced concrete, by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete, as required, for placement and workability.

2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use high range water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.14 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Refer to the General Notes Sheet of the Contract Drawings.

2.15 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.16 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M and ASTM C1116/C1116M, and furnish batch ticket information.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

1. Class A, 1/8 inch for smooth-formed finished surfaces.
2. Class C, 1/2 inch for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

M. Do not use earth cuts as concrete formworks unless approved by the Engineer.

3.2 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.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORES AND RESHORES

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 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 and seal with manufacturer's recommended tape.
2. Vapor retarder installation must be approved prior to concrete placement.

B. Bituminous Vapor Retarders: Place, protect, and repair vapor retarders according to manufacturer's written instructions.

3.6 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

1. Weld reinforcing bars according to AWS D1.4, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.7 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
3. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings, grade beams, pile caps, and floor slabs.
4. Space vertical joints in walls as indicated in the Drawings but not more than 20 ft. o.c. and 15 ft. from corners. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
5. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade, toppings, and washes: Form weakened-plane contraction joints, sectioning concrete into areas as indicated in the Drawings but not more than 15 ft o.c. in each way, unless noted otherwise on the Drawings. Provide contraction joints in toppings and washes above every precast joint and at other locations indicated on the Drawings. Construct contraction joints for a depth equal to at least 1/4 of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Saw cutting of joints is strictly prohibited.
3. Sawed Joints: Saw cutting and soft cutting of joints in toppings and washes is strictly prohibited.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 7 Section "Garage Waterproofing Systems," are indicated.

3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled 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.

3.8 WATERSTOPS

A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

3.9 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. 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. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Use specified non-chloride accelerator only. Do not use calcium chloride, salts or other admixtures containing more than 0.05% chloride ions by weight.

F. Hot-Weather Placement: Comply with ACI 305.1 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.
3. Use approved water-reducing, retarding admixture to "normalize" initial set.

G. The following tolerances, in addition to ACI 117 and PCI MNL 117 requirements, should be met when connecting precast concrete units to cast-in-place concrete structures:

1. Footings

    a. Variation of bearing surface from specified elevation: +- 1/2in.

2. Piers, columns, and walls

    a. Variation in plane from straight lines parallel to specified linear building lines: 1/40 in per ft for adjacent members less than 20 ft apart or any wall or bay length less than 20 ft.; 1/2 inch for adjacent members 20 ft or more apart of any wall or bay length of 20 ft or more.
    b. Variation in plane from straight lines parallel to specified grade lines: 1/40 in for adjacent members less than 20 ft apart or any wall or bay length less than 20 ft.; 1/2 inch for adjacent members 20 ft or more apart of any wall or bay length of 20 ft or more.

3. Anchor bolts

    a. Variations form specified location in plan: +- 1/4 in.
    b. Variations center to center of any two bolts within an anchor group: +- 1/8 in.
    c. Variations from specified elevation: +- 1/2 in.
    d. Anchor bolt projection: - 1/4 in , + 1/2 in.
    e. Plumbness of anchor projection: +- 1/16 in.

3.10 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, to be covered with a coating or covering material applied directly to concrete and as indicated.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Architectural Concrete Finish: Provide smooth uniform finish upon form removal with no patching, stoning or other form of repair, except washing, permitted unless otherwise noted, for walls, columns and other surfaces visible to view when the work is complete. The surface shall match approved jobsite mockup.

E. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.11 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in 1 direction.

1. Apply scratch finish to surfaces indicated and to receive concrete floor toppings.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces indicated to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
2. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-foot-long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 1/4 inch

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.

F. Broom Finish for Flatwork in Parking and Drive Areas: Apply a broom finish to all driving and parking areas, ramps, and elsewhere as indicated.

1. Bullfloat immediately after screeding. Complete before any excess moisture or bleed water is present on surface (ACI 302.1R, Article 7.2.3). Use of power-propelled rotary trowelling machines with float blades shall be prohibited.
2. After excess moisture or bleed water has disappeared and concrete has stiffened sufficiently to allow operation, give slab surface a coarse straight broom transverse finish scored 3/16 inch deep texture by drawing a stiff bristle broom across surface perpendicular to main traffic route. Texture shall be as accepted by Architect from sample panels. Coordinate with Traffic Topping manufacturer and applicator as to acceptability.
3. Finishing Tolerance: Bullfloated floor finish tolerance per ACI 117 section 4.5.7. If required, more stringent tolerances shall be used to assure that the slabs drain freely to floor drains. In addition, floor surface shall not vary more than ±3/4" from elevation noted on Drawings.
4. Before installation of flatwork and after submittal, review, and approval of concrete mix design, Contractor shall fabricate one or more acceptable test panels simulating finishing techniques and final appearance to be expected and used on Project. Test panels shall be

minimum of 15 ft. in area cast to thickness of typical parking and drive area wearing surface in Project. (Maximum thickness of test panels need not exceed 6 inches.) Test panels shall be cast from concrete supplied by similar concrete batch used for this project. Contractor shall finish panels following requirements of items 1,2 and 3 above. Architect may reject finished panels, in which case Contractor shall repeat procedure until Architect acceptance is obtained. Accepted test panels shall be cured in accordance with specifications and may be incorporated into Project. Accepted test panels shall serve as basis for acceptance/rejection of final finished surfaces of all flatwork.

5. Finish all concrete slabs including toppings and washes to proper elevations to insure that all surface water will drain freely to floor drains, and that no puddle areas exist. Contractor shall bear cost of any corrections to provide for this positive drainage requirement.
6. The Contractor shall arrange for and wet all slabs with water for the purpose of detecting any defects in the concrete that would result in leaks and/or inadequate drainage. Slab surfaces shall be wetted until water flows freely to drains. No finished spaces shall be sealed or insulated or ceilings installed until drainage test has been completed on the slab above and reviewed by the Architect for acceptance.

    a. Water ponding is not acceptable. Repair low spots and puddles so water can flow freely to floor drains.
    b. Rout and seal leaking joints that are usually located at expansion joints, control joints, or construction joints. These leaking joints are located by water observed on the underside of the slabs and opposite faces of walls. If the expansion joint is not installed at the time of the flood test, this area shall be tested after it is installed.
    c. Rout and seal cracks that are located when water is observed on the underside of the slab. Cracks may also be observed on the top surface of the slab when the concrete slabs are drying and the cracks are highlighted with moisture.

G. Elevator and Stair Lobbies, Landings, and Treads Concrete Finish: Provide non-slip, broom or medium sandblast, uniform finish with no patching, stoning or other form of repair, except washing, permitted unless otherwise noted, for top surface of lobbies, stair landings, and treads when the work is complete. The surface shall match approved jobsite mockup.

3.12 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

3.13 CONCRETE PROTECTING 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. 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 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.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the methods shown below. Use moisture curing, moisture-retaining cover curing, or a combination thereof under normal weather conditions. Use of curing compounds shall be allowed only in excessive hot or cold weather conditions subject to the approval of the Engineer.

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

    a. Water.
    b. Continuous water-fog spray.
    c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

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, 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.

    a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
    b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
    c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

3. Curing Compound (to be used for hot or cold weather concreting only): Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

3.14 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/4 inch in any dimension in solid concrete, but not less than 1/2 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with approved underlayment or overlayment materials. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

5. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
6. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and /or polymer repair mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:

1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
   a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C 143/C 143M; one test at point of placement for each truck of concrete. Reduce frequency of tests when concrete tests results were consistently within acceptable range upon approval from Engineer.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each truck of concrete. Reduce frequency to one test out of each composite sample when test results are consistently within acceptable range upon approval from Engineer.

4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Unit Weight: ASTM C 567, fresh unit weight of concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Compression Test Specimens: ASTM C 31/C 31M; choose either 6”x12” specimens (two cylinders per set) or 4”x8” specimens (three cylinders per set) for standard cylinder testing., Test minimum 3 sets of standard cylinders for each composite sample. Mold and store cylinders for laboratory-cured test specimens for 7-day and 28-day strength testing.
    a. Cast and laboratory-cure 3 sets of standard cylinder specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C 39/C 39M.
    a. Test 1 set of laboratory-cured specimens at 7 days, and 1 set of laboratory-cured specimens at 28 days. Retain 1 set of laboratory-cured specimens in reserve for later testing if required.
    b. A compressive-strength test shall be the average compressive strength from a set of specimens obtained from same composite sample and tested at age indicated.
8. When strength of 7-day laboratory-cured cylinders is less than 75 percent of 28-day design strength, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
10. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
11. Non-Compliant Test Reports: All test reports indicating non-compliance should be electronically sent immediately to all parties on the test report distribution list. Hard copies of non-conforming test reports shall be submitted on different colored paper.
12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
15. Correct deficiencies in the Work that test reports and inspections indicate does not comply with the Contract Documents.

END OF SECTION 033000

SECTION 034000 - PRECAST CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes both architectural and structural precast concrete units, including the following:
   1. Double tees.
   2. Inverted tee beams.
   3. Interior and exterior ledger beams.
   4. Exterior load bearing and non-load bearing spandrels.
   5. Columns and "light" walls.
   6. Shear walls.
   7. Wall panels and stairs.
   8. Solid planks.
   9. Miscellaneous infill and cladding.

B. Related Sections include the following:

   1. Division 3 Section "Cast-in-Place Concrete" for additional information and requirements for concrete.
   2. Division 4 Section "Unit Masonry " for full-size brick facing, mortar, and anchorages.
   3. Division 7 Section "Joint Sealants" for elastomeric joint sealants and sealant backings.
   4. Division 7 Section "Garage Waterproofing Systems" for waterproofing applied to precast concrete.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide precast concrete units and connections capable of withstanding governing design loads within limits and under conditions indicated.

B. Engineering Responsibility: Engage a fabricator who assumes undivided responsibility for engineering precast units by employing a qualified professional engineer to prepare design calculations, shop drawings, and other structural data.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include testing criteria and procedures for each type of grout.

B. Design Mixes: For each concrete mix.

C. Shop Drawings: Detail fabrication and installation of precast concrete units. Indicate member locations, plans, elevations, dimensions, shapes, cross sections, openings, limits of each finish, and types of reinforcement, including special reinforcement. If shop drawings are submitted in a single package the submittal processing time as defined in specification section 013300 “Submittal Procedures” will need to be extended. In this case, the submittal package should include a prioritized list indicating the order that specific portions of the package should be reviewed and returned. The Contractor will be notified of the required submittal processing time once the Architect receives the submittal package and has a chance to assess its magnitude. However, rather than submitting a single submittal package, it is recommended that the Contractor breakdown the submittal package into smaller partial submittals that can be reviewed and returned in a timelier manner.
1. Indicate welded connections by AWS standard symbols. Detail loose and cast-in hardware, inserts, connections, and joints, including accessories.
2. Indicate locations and details of anchorage devices to be embedded in other construction.
3. Comprehensive engineering analysis signed and sealed by the qualified professional engineer responsible for its preparation.

    a. Include calculated fire-resistance analysis as required.

D. Samples: Unless noted otherwise, provide the following samples:

1. For each type of finish indicated on exposed surfaces of precast architectural concrete units, in sets of 3, illustrating full range and quality of finishes, colors, and texture variations expected; approximately 12 by 12 by 2 inches.
2. Two full height by 4 feet long samples of exterior panel designated "Architectural Finish" on the Drawings. Panels shall be available at plant for observation by Owner, Architect, and Engineer. Deliver one panel to jobsite when directed by Architect.

E. Samples of bearing pads.

1.5 INFORMATIONAL SUBMITTALS

A. Welding Certificates: Copies of certificates for welding procedures and personnel.

B. Erection Certificates: Copies of certificates for erection procedures signed and sealed by a qualified professional engineer as follows:

1. Prior to erection, certification stating that erection sequence and all details for temporary guying, staying and shoring of structure has been reviewed and approved.
2. After erection, erection and alignment certification that structure has been erected within required specifications and tolerances.

C. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

D. Material Test Reports: From a qualified testing agency indicating and interpreting test results of the following for compliance with requirements indicated:

E. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:

1. Concrete materials.
2. Reinforcing materials and prestressing tendons.
3. Admixtures.
4. Bearing pads.
5. Water-absorption test reports.
6. Thin brick units and accessories.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced and PCI-qualified installer who has completed precast concrete work 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.

B. Fabricator Qualifications: A firm that complies with the following requirements and is experienced in manufacturing precast concrete units similar to those indicated for this Project and with a record of successful in-service performance.

1. Assumes responsibility for engineering precast concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
2. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of New York and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of precast concrete that are similar to those indicated for this Project in material, design, and extent.
3. Participates in PCI's Plant Certification program and is designated a PCI-certified plant for Group A, Category AA or AB and Group C, Category C3.
4. Has sufficient production capacity to produce required units without delaying the Work.
5. Has completed successfully a minimum of five (5) similar projects in the past three (3) years.
6. Is registered with and approved by authorities having jurisdiction.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

D. Design Standards: Comply with ACI 318 and the design recommendations of PCI MNL 120, "PCI Design Handbook--Precast and Prestressed Concrete."

E. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, camber, and dimensional tolerances for types of units required, comply with PCI MNL 116, "Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products" and PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."

F. Product Options: The drawings indicate size, profiles, and dimensional requirements of precast concrete units and are based on the specific types of units indicated. Fabricators' precast concrete units with equal performance characteristics may be considered only if approved in advance by Engineer or as described below. Refer to Division 1 Section "Substitutions."

1. Double tees with standard widths between 12' and 15' are acceptable base bid options. If one option is selected that is not detailed on the Drawings, precast fabricator shall be responsible for any redesign as required. Coordinate with Division 7 Section "Garage Waterproofing Systems".

G. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel"; AWS D1.4, "Structural Welding Code--Reinforcing Steel"; and AWS D1.6, "Structural Welding Code--Stainless Steel."

H. Calculated Fire Resistance: Where indicated, provide precast concrete units whose fire resistance has been calculated according to PCI MNL 124, "Design for Fire Resistance of Precast Prestressed Concrete," ACI 216.1/TMS 0216.1, "Standard Method for Determining Fire Resistance of Concrete and Masonry Construction Assemblies," and is acceptable to authorities having jurisdiction.

I. Fire-Test-Response Characteristics: Provide precast concrete units that comply with the following requirements:

1. Fire-response testing was performed by UL, ITS, or another testing and inspecting agency that is acceptable to authorities having jurisdiction and that performs testing and follow-up services.
2. Fire-resistance-rated assemblies, which are indicated by design designations from UL's "Fire Resistance Directory," from ITS's "Directory of Listed Products," or from the listings of another testing and inspecting agency, are identical in materials and construction to those tested per ASTM E 119.
3. Products are identified with appropriate markings of applicable testing and inspecting agency.

J. Sample Panels: Before fabricating precast architectural concrete units, produce sample panels to establish the approved range of selections made under sample Submittals. Produce a minimum of 3 sets of full-scale sample panels, approximately 48 inches long by 48 inches high, to demonstrate the expected range of finish, color, and texture variations.

1. Locate panels where indicated or, if not indicated, as directed by Architect.
2. In presence of Architect, damage part of an exposed-face surface for each finish, color, and texture, and demonstrate materials and techniques proposed for repair of surface blemishes to match adjacent undamaged surfaces.
3. Maintain sample panels during construction in an undisturbed condition as a standard for judging the completed Work.
4. Demolish and remove sample panels when directed.

K. Mockups: Before installing architectural precast concrete units, build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:

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. Obtain Architect's approval of mockups before starting fabrication.
4. In presence of Architect, damage part of an exposed face for each finish, color, and texture, and demonstrate materials and techniques proposed for repairs to match adjacent undamaged surfaces.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed.
7. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

L. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver precast concrete units to Project site in such quantities and at such times to ensure continuity of installation. Store units at Project site to prevent cracking, distorting, warping, staining, or other physical damage, and so markings are visible.

B. Lift and support units only at designated lifting and supporting points as shown on Shop Drawings.

1.8 SEQUENCING

A. Furnish anchorage items to be embedded in other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 - PRODUCTS

2.1 MOLD MATERIALS

A. Molds: Provide molds and, where required, form-facing materials of metal, plastic, wood, or another material that is nonreactive with concrete and dimensionally stable to produce continuous and true precast concrete surfaces within fabrication tolerances and suitable for required finishes.

B. Form Liners: Units of face design, texture, arrangement, and configuration indicated.

2.2 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

C. Steel Bar Mats: ASTM A 184/A 184M, assembled with clips, as follows:

1. Steel Reinforcement: ASTM A 615/A 615M, Grade 60, deformed bars.

D. Plain-Steel Wire: ASTM A 82, as drawn.

E. Deformed-Steel Wire: ASTM A 496.

F. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

G. Deformed-Steel Welded Wire Fabric: ASTM A 497, flat sheet.

H. Supports: Manufacturer's bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place according to CRSI's "Manual of Standard Practice," PCI MNL 116, and as follows:

1. For uncoated reinforcement, use CRSI Class 1 plastic-protected bar supports.

2.3 PRESTRESSING TENDONS

A. Prestressing Strand: ASTM A 416, Grade 270, uncoated, 7-wire, low-relaxation strand.

2.4 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type III, gray and white, of same type, brand, and source.

1. Standard gray portland cement may be used for structural precast concrete that is not classified as architectural precast concrete and when an architectural mix requires gray portland cement.

B. Normal-Weight Aggregates: Except as modified by PCI MNL 116 and PCI MNL 117, ASTM C 33, with coarse aggregates complying with Class 5S.

C. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 116 and PCI MNL 117.

D. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

E. Water-Reducing Admixture: ASTM C 494, Type A.

F. Retarding Admixture: ASTM C 494, Type B.

G. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

H. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.

I. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.

J. Plasticizing Admixture: ASTM C 1017.

K. Fly Ash Admixture: ASTM C 618, Class C or F.

L. Metakaolin Admixture: ASTM C 618, Class N.

M. Calcium Nitrite Corrosion Inhibitor: Add 2 gallons per cu. yd. of concrete for double tees, inverted tee girders, solid slabs, and stairs.

2.5 STEEL CONNECTION MATERIALS

A. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.

B. Carbon-Steel Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished; AWS D1.1, Type A or B, with arc shields.

C. Carbon-Steel Plate: ASTM A 283/A 283M.

D. Malleable Steel Castings: ASTM A 47.

E. Carbon-Steel Castings: ASTM A 27/A 27M, Grade 60-30.

F. High-Strength, Low-Alloy Structural Steel: ASTM A 572/A 572M.

G. Carbon-Steel Structural Tubing: ASTM A 500, Grade B.

H. Wrought Carbon-Steel Bars: ASTM A 675/A 675M, Grade 65.

I. Deformed-Steel Wire or Bar Anchors: ASTM A 496 or ASTM A 706/A 706M.

J. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A; carbon-steel, hex-head bolts and studs; carbon-steel nuts; and flat, unhardened steel washers.

K. High-Strength Bolts and Nuts: ASTM A 325, Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers.

L. Finish: For exterior steel items, steel in exterior walls, and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A 123/A 123M, after fabrication, and ASTM A 153/A 153M, as applicable.

1. Galvanizing Repair Paint: High-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20.

M. Shop-Primed Finish: Prepare surfaces of non-galvanized steel items, except those surfaces to be embedded in concrete, according to requirements in SSPC-SP 3 and shop-apply lead- and chromate-free, rust-inhibitive primer, complying with performance requirements in FS TT-P-664 according to SSPC-PA 1.

N. Reglets: Stainless steel.

O. Welding Electrodes: Comply with AWS standards.

P. Accessories: Provide clips, hangers, plastic shims, and other accessories required to install precast structural concrete units.

1. For providing through opening in double tee stems for electrical and mechanical penetration, use the "Double Tee Stem Blockout" by High Concrete Accessories, Denver, PA or approved equal.

2.6 STAINLESS-STEEL CONNECTION MATERIALS

A. Stainless-Steel Plate: ASTM A 666, Type 304, of grade suitable for application.

B. Stainless-Steel Bolts and Studs: ASTM F 593, alloy 304 or 316, hex-head bolts and studs; stainless-steel nuts; and flat, stainless-steel washers.

C. Stainless-Steel Headed Studs: ASTM A 276.

2.7 BEARING PADS

A. Provide bearing pads for precast structural concrete units as follows:

1. Elastomeric Pads: AASHTO M 251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, 50 to 70 Shore A durometer, minimum tensile strength 2250 psi per ASTM D 412.
2. Random-Oriented, Fiber-Reinforced Elastomeric Pads for Double Tees, Spandrel Beams, Walls, and Lightly Loaded Girders: Preformed, randomly oriented synthetic fibers set in elastomer. Surface hardness of 70 to 90 Shore A durometer.
3. Cotton-Duck-Fabric-Reinforced Elastomeric Pads for Girders and other Heavy Load Bearing Components: Preformed, horizontally layered cotton-duck fabric bonded to an elastomer. Surface hardness of 80 to 100 Shore A durometer.
4. Frictionless Pads: Tetrafluoroethylene, glass-fiber reinforced, bonded to mild-steel plate, of type required for in-service stress.
5. Hardboard: AHA A135.4, Class 1, tempered hardboard strips, smooth on both sides.
6. High-Density Plastic: Multimonomer, nonleaching, plastic strip.

2.8 GROUT MATERIALS

A. Sand-Cement Grout: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 144. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, of consistency suitable for application.

C. Epoxy Grout: ASTM C 881, 2-component epoxy resin, of type, grade, and class to suit requirements.

2.9 THIN BRICK UNITS AND ACCESSORIES Adhere to PCI Tolerances

A. Thin Brick Units: ASTM C 1088, Grade Exterior, Type TBX, 5/8" to 3/4 inch thick, and as follows:

1. Face Size: Standard, 2-1/4 inches high by 8 inches long.

2. Special Shapes: Include corners, edge corners, and end edge corners.
3. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested per ASTM C 67.
4. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
5. Face Color and Texture: Reference Elevation Finish Legend on Drawings and from full range of manufacturers pallet.
6. Back Surface Texture: Scored, combed, wire roughened, or ribbed.
7. Single-Use Template System for Brick Embed Application: Scott System Brick Snap modular templates formed of recyclable stryrene plastic to surround single brick units, having factory-applied bond breaker.
8. Products: Subject to compliance with requirements, provide one of the following:

9. Commadore Velour Medium Flash by Belden Brick Company or approved equalPrecaster to set aside sufficient quantities of thin brick from the same production runs for potential field repairs during construction so as to match existing.
10. Provide 100 square feet of Brick No. 1 and 50 square feet of Brick No. 2 to Owner at end of project as attic stock for potential future repairs.

B. Setting Mortar: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 144. Mix at ratio of 1 part cement to 4 parts sand, by volume, with minimum water required for placement.

C. Latex-Portland Cement Pointing Grout: ANSI A118.6 and as follows:

1. Dry-grout mixture, factory prepared, of portland cement, graded aggregate, and dry, redispersible, ethylene-vinyl-acetate additive for mixing with water; uniformly colored.
2. Commercial portland cement grout, factory prepared, with liquid styrene-butadiene rubber or acrylic-resin latex additive; uniformly colored.
3. Colors: Match Architect's samples or as selected by Architect from manufacturer's full range.

2.10 INSULATED PANEL ACCESSORIES

A. Extruded-Polystyrene Board Insulation: Rigid, cellular polystyrene thermal insulation formed from polystyrene base resin by an extrusion process using HCFCs as blowing agents; square edged; complying with ASTM C 578, Type IV, 1.6-lb/cu. ft. minimum density.

B. Polyisocyanurate Board Insulation: Rigid, cellular polyisocyanurate thermal insulation with core formed by using HCFCs as blowing agents; square edged; complying with ASTM C 1289, Type II, with nonasphaltic facers.

C. Noncomposite Wythe Connectors: Glass-fiber and vinyl-ester polymer connectors, polypropylene pin connectors, or stainless-steel pin connectors manufactured to connect wythes of precast concrete panels without shear transfer.

2.11 CONCRETE MIXES

A. Prepare design mixes for each type of concrete required. Refer to the General Notes Sheet of the Drawings for specific requirements.
   1. Limit use of fly ash to 25 percent replacement of portland cement by weight and granulated blast-furnace slag to 40 percent of portland cement by weight; metakaolin and silica fume to 10 percent of portland cement by weight.

B. Design mixes may be prepared by a qualified independent testing agency or by qualified precast plant personnel at precast concrete fabricator's option.

C. Limit water-soluble chloride ions to the maximum percentage by weight of cement permitted by ACI 318.

D. Normal-Weight Concrete: Proportion mixes by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:

   1. Minimum Compressive Strength (28 Days): As required in the Drawings.
   2. Maximum Water-Cementitious Materials Ratio: As required in the Drawings.
   3. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as required in the Drawings, with a tolerance of plus or minus 1-1/2 percent.

E. Water Absorption: 12 to 14 percent by volume, tested according to PCI MNL 117.

F. Other Admixtures: Use water-reducing, high-range water-reducing, water-reducing and accelerating, or water-reducing and retarding admixtures according to manufacturer's written instructions.

G. Concrete Mix Adjustments: Concrete mix design adjustments may be proposed if characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

2.12 MOLD FABRICATION

A. Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing operations.

1. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during concreting. Coat form liner with form-release agent.

B. Maintain molds to provide completed precast architectural concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.

1. Edge and Corner Treatment: Uniformly chamfered.

2.13 THIN BRICK FACINGS

A. Place form liner templates accurately to provide grid for thin brick facings. Provide solid backing and supports to maintain stability of liners while placing thin bricks and during concreting.

B. Securely place thin brick units face down into form liner pockets.

C. Thin brick form liner shall produce slightly concaveshaped joints that are free of bug holes and voids.

D. Clean faces and joints of brick facing.

2.14 FABRICATION OF ARCHITECTURAL AND STRUCTURAL PRECAST CONCRETE

A. Coordination with Other Trades: Unless specifically noted otherwise, the precaster shall be responsible for providing embeds, blockouts, and openings in the precast components that are required for the following trades and as indicated in the Drawings:

1. Mechanical, Electrical, Plumbing, Fire Protection, and Security trades
2. Façade framing and lighting
3. Canopy framing and corresponding MEP/FP/Security trades
4. Solar panel system framing and corresponding MEP/FP/Security trades
5. Guardrail and handrail systems including posts for all stairs
6. Curtainwall and storefront support system
7. Elevator appurtenances
8. Expansion joint blockouts

B. Formwork: Accurately construct forms, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for pretensioning and detensioning operations. Maintain formwork to provide completed precast concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances.

1. Coat surfaces of forms with bond-breaking compound before reinforcement is placed. Provide commercial-formula, form-coating compounds that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces requiring bond or adhesion. Apply in compliance with manufacturer's written instructions.

2. Unless forms for precast, prestressed concrete units are stripped before detensioning, design forms so stresses are not induced in precast concrete units because of deformation or movement of concrete during detensioning.

C. Built-in Anchorages: Accurately position built-in anchorage devices and secure to formwork. Locate anchorages where they do not affect position of main reinforcement or concrete placement. Do not relocate bearing plates in units unless approved by Architect.

D. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.

E. Furnish loose steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing precast architectural concrete units to supporting and adjacent construction.

F. Cast-in reglets, slots, holes, and other accessories in precast architectural concrete units to receive windows, cramps, dowels, reglets, waterstops, flashings, and other similar work as indicated.

G. Cast-in openings larger than 10 inches in diameter or 10 inches square according to Shop Drawings. Smaller holes may be field cut by trades requiring them, as approved by Architect.

H. Reinforcement: Comply with recommendations in CRSI's "Manual of Standard Practice" and PCI MNL 116 and PCI MNL 117 for fabricating, placing, and supporting reinforcement.

1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete.
2. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete-placement operations. Locate and support reinforcement by metal chairs, runners, bolsters, spacers, and hangers, as required.
3. Place reinforcement to obtain at least the minimum coverage for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
4. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

I. Reinforce precast concrete units to resist handling, transportation, and erection stresses.

J. Prestress tendons for precast concrete units by either pretensioning or posttensioning methods. Comply with PCI MNL 116 and PCI MNL 117.

1. Delay detensioning until concrete has reached at least 70 percent of its compressive strength as established by test cylinders cured under the same conditions as concrete.
2. If concrete has been heat cured, detension while concrete is still warm and moist to avoid dimensional changes that may cause cracking or undesirable stresses.

3. Detension pretensioned tendons either by gradually releasing tensioning jacks or by heat-cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.

K. Mix concrete according to PCI MNL 116, PCI MNL 117 and requirements in this Section. After concrete batching, no additional water may be added.

L. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units. Comply with requirements in PCI MNL 116 and PCI MNL 117 for measuring, mixing, transporting, and placing concrete.

M. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items. Use equipment and procedures complying with PCI MNL 116 and PCI MNL 117.

N. Comply with ACI 306.1 procedures for cold-weather concrete placement.

O. Comply with ACI 305R recommendations for hot-weather concrete placement.

P. Identify pickup points of precast concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint casting date on each precast concrete unit on a surface that will not show in finished structure.

Q. Cure concrete, according to requirements in PCI MNL 116 and PCI MNL 117, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture.

R. Discard precast concrete units that are warped, cracked, broken, spalled, stained, or otherwise defective unless repairs are approved by Architect.

S. Product Tolerances: Fabricate precast concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished unit complies with fabrication tolerances. For fabrication tolerances of architectural and structural precast units, refer to Part 2 “FABRICATION TOLERANCES” Paragraph of this specification Section.

T. Protect strand ends and anchorages that are visible after erection or exposed to the weather with a minimum of 1-inch-thick, nonmetallic, nonshrink, grout mortar and sack rub surface. Coat or spray the inside surfaces of pocket with bonding agent before installing grout. All other strand ends and anchorages that are concealed from view and weather shall be protected with bituminous, zinc-rich, or epoxy paint to avoid corrosion and possible rust spots.

2.15 ARCHITECTURAL PRECAST CONCRETE UNITS

A. Provide Architectural Precast Concrete Units where indicated on Drawingsand as follows:

1. All exterior spandrels, columns, walls, and infill panels.
2. All closure spandrels (typically at Top Tier).
3. All precast concrete units at the stair and elevator towers.
4. Interior columns that border the stair and elevator towers.
5. Interior beams and girders that border the stair and elevator towers.

B. Finish units as defined in Part 2 “FINISHES - ARCHITECTURAL PRECAST CONCRETE UNITS”.

C. Reinforce units to resist transportation and erection stresses.

D. Include cast-in weld plates where required.

E. Coordinate with other trades for installation of cast-in items.

2.16 SOLID SLAB UNITS

A. Type: Precast, prestressed concrete solid slab units.

B. Furnish units free of voids and honeycombs.

C. Finish units as defined in Part 2 “FINISHES - STRUCTURAL PRECAST CONCRETE UNITS”, unless otherwise indicated.

1. Provide non-slip finish to top surface of stair and lobby slabs, unless otherwise indicated.

D. Reinforce units to resist transportation and erection stresses.

E. Include cast-in weld plates where required.

F. Coordinate with other trades for installation of cast-in items.

G. Provide solid, monolithic, precast concrete slab units forming an integral part of slab unit system. Design and fabricate solid units to dimensions and details indicated for slab units.

H. Provide headers of cast-in-place concrete or structural-steel shapes for openings larger than one slab width according to slab unit fabricator's written recommendations.

2.17 LONG-SPAN UNITS

A. Type: Plant-fabricated, precast, prestressed concrete long-span units.

B. Furnish units free of voids and honeycombs.

C. Finish units as defined in Part 2 “FINISHES - STRUCTURAL PRECAST CONCRETE UNITS”, unless otherwise indicated.

D. Reinforce units to resist transportation and erection stresses.

E. Include cast-in weld plates where required.

F. Coordinate with other trades for installation of cast-in items.

2.18 STRUCTURAL FRAMING UNITS

A. Type: Precast, prestressed and non-prestressed structural concrete framing units.

B. Furnish units free of voids and honeycombs.

C. Finish units as defined in Part 2 “FINISHES - STRUCTURAL PRECAST CONCRETE UNITS”, unless otherwise indicated.

D. Reinforce units to resist transportation and erection stresses.

E. Include cast-in weld plates where required.

F. Coordinate with other trades for installation of cast-in items.

2.19 FABRICATION TOLERANCES

A. Fabricate precast structural concrete units to shapes, lines, and dimensions indicated so each finished unit complies with PCI MNL 116 product dimension tolerances as well as position tolerances for cast-in items.

B. Fabricate precast architectural concrete units straight and true to shapes, lines, and dimensions indicated with exposed edges and corners precise and true so each finished panel complies with PCI MNL 117 product tolerances as well as the following product tolerances:

1. Overall Height and Width of Units, Measured at the Face Exposed to View: As follows:

    a. 10 feet or under, plus or minus 1/8 inch.
    b. 10 to 20 feet, plus 1/8 inch, minus 3/16 inch.
    c. 20 to 40 feet, plus or minus 1/4 inch.
    d. Each additional 10 feet, plus or minus 1/16 inch.

2. Overall Height and Width of Units, Measured at the Face Not Exposed to View: As follows:

    a. 10 feet or under, plus or minus 1/4 inch.
    b. 10 to 20 feet, plus 1/4 inch, minus 3/8 inch.
    c. 20 to 40 feet, plus or minus 3/8 inch.
    d. Each additional 10 feet, plus or minus 1/8 inch.

3. Total Thickness or Flange Thickness: Plus 1/4 inch, minus 1/8 inch.
4. Rib Thickness: Plus or minus 1/8 inch.
5. Rib to Edge of Flange: Plus or minus 1/8 inch.
6. Distance between Ribs: Plus or minus 1/8 inch.
7. Variation from Square or Designated Skew (Difference in Length of the Two Diagonal Measurements): Plus or minus 1/8 inch per 72 inches or 1/2 inch total, whichever is greater.
8. Length and Width of Block-outs and Openings within One Unit: Plus or minus 1/4 inch.
9. Location and Dimension of Block-outs Hidden from View and Used for HVAC and Utility Penetrations: Plus or minus 3/4 inch.

10. Dimensions of Haunches: Plus or minus 1/4 inch.
11. Haunch Bearing Surface Deviation from Specified Plane: Plus or minus 1/8 inch.
12. Difference in Relative Position of Adjacent Haunch Bearing Surfaces from Specified Relative Position: Plus or minus 1/4 inch.
13. Bowing: Plus or minus L/360, maximum 1 inch.
14. Local Smoothness: 1/4 inch per 10 feet.
15. Variation between Adjacent Thin-Brick-Facing Products: 1/16 inch.
16. Warping: 1/16 inch per 12 inches of distance from the nearest adjacent corner.
17. Tipping and Flushness of Plates: Plus or minus 1/4 inch.
18. Dimensions of Architectural Features and Rustications: Plus or minus 1/8 inch.

C. Position Tolerances for precast architectural concrete units: For cast-in items measured from datum line location, as indicated on Shop Drawings.

1. Weld Plates: Plus or minus 1 inch.
2. Inserts: Plus or minus 1/2 inch.
3. Handling Devices: Plus or minus 3 inches.
4. Reinforcing Steel and Welded Wire Fabric: Plus or minus 1/4 inch where position has structural implications or affects concrete cover; otherwise, plus or minus 1/2 inch.
5. Reinforcing Steel Extending out of Member: Plus or minus 1/2 inch of plan dimensions.
6. Tendons: Plus or minus 1/4 inch, vertical; plus or minus 1 inch, horizontal.
7. Location of Rustication Joints: Plus or minus 1/8 inch.
8. Location of Opening within Panel: Plus or minus 1/4 inch.
9. Flashing Reglets: Plus or minus 1/4 inch.
10. Flashing Reglets at Edge of Panel: Plus or minus 1/8 inch.
11. Reglets for Glazing Gaskets: Plus or minus 1/8 inch.
12. Electrical Outlets, Hose Bibs: Plus or minus 1/2 inch.
13. Haunches: Plus or minus 1/4 inch.
14. Allowable Rotation of Plate, Channel Inserts, Electrical Boxes: 2-degree rotation or 1/4 inch maximum over the full dimension of the unit.

2.20 FINISHES - STRUCTURAL PRECAST CONCRETE UNITS

A. Grade B Finish (typical): Fill air pockets and holes larger than 1/4 inch in diameter with sand-cement paste matching color of adjacent surfaces. Fill air holes greater than 1/8 inch in width that occur more than once per 2 sq. in.. Grind smooth form offsets or fins larger than 1/8 inch. Repair surface blemishes due to holes or dents in molds. Discoloration at form joints is permitted.

B. Grade A Finish (at stair and elevator lobbies and at surfaces to be painted or coated): Repair surface blemishes and fill air holes with the exception of air holes 1/16 inch in width or smaller, and form marks where the surface deviation is less than 1/16 inch. Float apply a neat cement-paste coating to exposed surfaces. Rub dried paste coat with burlap to remove loose particles. Discoloration at form joints is permitted. Grind smooth all form joints.

C. Screed or float finish unformed surfaces. Strike off and consolidate concrete with vibrating screeds to a uniform finish. Hand screed at projections. Normal color variations, minor indentations, minor chips, and spalls are permitted. Major imperfections, honeycombing, or defects are not permitted.

D. Smooth, steel trowel finish unformed surfaces. Consolidate concrete, bring to proper level with straightedge, float, and trowel to a smooth, uniform finish.

E. Apply roughened surface finish according to ACI 318 to precast concrete units that receive concrete topping after installation.

F. Broom Finish for Flatwork in Parking and Drive Areas: Apply a broom finish to all driving and parking areas, ramps, and elsewhere as indicated.
   1. After excess moisture or bleed water has disappeared and concrete has stiffened sufficiently to allow operation, give slab surface a coarse straight broom transverse finish scored 3/16-inch-deep texture by drawing a stiff bristle broom across surface perpendicular to main traffic route. Texture shall be as accepted by Architect from sample panels. Coordinate with Traffic Topping manufacturer and applicator as to acceptability.

G. Refer to Division 3 Section "Cast-in-Place Concrete", Part 3 Paragraph “Finishing Floors and Slabs” for additional information and requirements for finishing concrete floors and slabs.

2.21 FINISHES - ARCHITECTURAL PRECAST CONCRETE UNITS

A. Exposed faces to be free of joint marks, grain, and other obvious defects. Corners, including false joints to be uniform, straight, and sharp. Finish exposed-face surfaces of architectural precast concrete units to match approved sample panels or mockups and as follows:
   1. PCI and APA's "Architectural Precast Concrete Color and Texture Selection Guide (https://www.pci.org/ColorTextureGuide)" of plate numbers indicated.

      a. Architectural Mix No. 1 (Type A on the drawings) (Buff/Tan): The approximate color range is illustrated by plates No. 111, No. 113, and No. 123. The mix is to be comprised of cement, and fine and course aggregates, and pigment(s) as required to match the plates listed. Light to Medium sandblast finish as noted on the drawings. Precaster shall endeavor to use locally available aggregates.
      b. Architectural Mix No. 2 (Type B on the drawings) (White): The approximate color range is illustrated by plates No. 217, No. 218, No. 219. The mix is to be comprised of cement, fine and course aggregates, and pigment(s) as required to match the plates listed. Light to Medium sandblast finish as noted on the drawings. Precaster shall endeavor to use locally available aggregates.
      c. Architectural Mix No. 3 (Grey): The approximate color range is illustrated by plates No. 227 to 230. The mix is to be comprised of cement, and fine and course aggregates, and pigment(s) as required to match the plates listed. Light to Medium sandblast finish as noted on the drawings. Precaster shall endeavor to use locally available aggregates.

   2. Smooth-Surface Finish: Provide surfaces free of pockets, sand streaks, and honeycombs, with uniform color and texture.
   3. Abrasive-Blast Finish: Use abrasive grit, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces.

B. Finish exposed surfaces of precast architectural concrete units to match face-surface finish, unless noted otherwise.

C. Finish the following exposed surfaces of precast architectural concrete units by smooth, steel-trowel finish.

1. Back (inside) face of spandrels and columns that are not visible from the exterior.
2. Back (inside) face of walls and infill panels that are not visible from the exterior, except at stair/elevator towers.

D. Finish unexposed surfaces of precast architectural concrete units by float finish.

2.22 SOURCE QUALITY CONTROL

A. Owner will employ an independent testing agency to visit and evaluate precast concrete fabricator's quality-control and testing methods.

1. Allow Owner's testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with Owner's testing agency and provide samples of materials and concrete mixes as may be requested for additional testing and evaluation.

B. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 116 and PCI MNL 117 requirements. If using self-consolidating concrete, also test and inspect in accordance with PCI TR-6, ASTM C1610/C1610M, ASTM C1611/C1611M, ASTM C1621/C1621M, and ASTM C1712.

C. Strength of precast concrete units will be considered deficient if units fail to comply with ACI 318 and PCI MNL 116 requirements, including the following:

1. Units fail to comply with compressive-strength test requirements.
2. Reinforcement and prestressed tendons of units do not comply with fabrication requirements.
3. Concrete curing and protection of units against extremes in temperature fail to comply with requirements.
4. Units are damaged during handling and erecting.

D. Testing: If there is evidence that the strength of precast concrete units may be deficient or may not comply with ACI 318 and PCI MNL 116 requirements, Owner will employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C 42.

1. A minimum of three representative cores will be taken from units of suspect strength, from locations directed by Architect.
2. Cores will be tested in an air-dry condition per ACI 301 if units will be dry under service conditions.
3. Strength of concrete for each series of 3 cores will be considered satisfactory if the average compressive strength is equal to at least 85 percent of the 28-day design compressive strength and no single core is less than 75 percent of the 28-day design compressive strength.
4. Test results will be made in writing on the same day that tests are performed, with copies to Architect, Contractor, and precast concrete fabricator. Test reports will include the following:

a. Project identification name and number.
b. Date when tests were performed.
c. Name of precast concrete fabricator.
d. Name of concrete testing agency.
e. Identification letter, name, and type of precast concrete unit or units represented by core tests; design compressive strength; type of break; compressive strength at break, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.

E. Patching: If core test results are satisfactory and precast concrete units comply with requirements, clean and dampen core holes and solidly fill with precast concrete mix that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.

F. Dimensional Tolerances: Units with dimensions smaller or larger than required and not complying with tolerance limits may be subject to additional testing.

1. Precast concrete units with dimensions larger than required will be rejected if the appearance or function of the structure is adversely affected or if larger dimensions interfere with other construction. Repair or remove and replace rejected units, as required, to comply with construction conditions.

G. Defective Work: Precast concrete units that do not comply with requirements, including strength, manufacturing tolerances, and finishes, are unacceptable. Replace with precast concrete units that comply with requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Do not install precast concrete units until supporting concrete has attained minimum design compressive strength.

3.2 INSTALLATION

A. Install clips, hangers, and other accessories required for connecting precast architectural concrete units to supporting members and backup materials.

B. Install precast concrete units. Provide temporary supports and bracing as required to maintain position, stability, and alignment as units are being permanently connected.

1. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
2. Remove projecting hoisting devices and use sand-cement grout to fill voids within recessed hoisting devices flush with surface of concrete.

C. Anchor precast concrete units in position by bolting, welding, grouting, or as otherwise indicated. Remove temporary shims, wedges, and spacers as soon as possible after anchoring and grouting are completed.

D. Bearing Pads: Install bearing pads as precast concrete units are being erected. Set pads on true, level, and uniform bearing surfaces and maintain in correct position until precast concrete units are placed.

E. Welding: Perform welding in compliance with AWS D1.1 and AWS D1.4, with qualified welders.

1. Protect precast concrete units and bearing pads from damage by field welding or cutting operations and provide noncombustible shields as required.
2. Repair damaged metal surfaces by cleaning and applying a coat of galvanized repair paint to galvanized surfaces.

F. Fasteners: Do not use drilled or powder-actuated fasteners for attaching accessory items to precast, prestressed concrete units unless approved by Architect.

G. At bolted connections, use lock washers or other acceptable means to prevent loosening of nuts.

H. Grouting Connections and Joints: After precast concrete units have been placed and secured, grout open spaces at keyways, connections, and horizontal and vertical joints unless noted otherwise, as follows:

1. Provide forms or other approved method to retain grout in place until hard enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled. Place grout to finish smooth, level, and plumb with adjacent concrete surfaces. Keep grouted joints damp for not less than 24 hours after initial set. Promptly remove grout material from exposed surfaces before it hardens.

3.3 ERECTION TOLERANCES

A. Install precast structural concrete units level, plumb, square, and true, without exceeding the recommended erection tolerances in PCI MNL 127, "Recommended Practice for Erection of Precast Concrete."

B. Install precast architectural concrete units level, plumb, square, true, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 117, Appendix I as well as the following noncumulative erection tolerances:

1. Plan Location from Building Grid Datum: Plus or minus 1/2 inch.
2. Plan Location from Centerline of Steel: Plus or minus 1/2 inch.
3. Top Elevation from Nominal Top Elevation: As follows:

a. Exposed Individual Panel: Plus or minus 1/4 inch.
b. Nonexposed Individual Panel: Plus or minus 1/2 inch.
c. Exposed Panel Relative to Adjacent Panel: 1/4 inch.
d. Nonexposed Panel Relative to Adjacent Panel: 1/2 inch.

4. Support Elevation from Nominal Support Elevation: As follows:

   a. Maximum Low: 1/2 inch.
   b. Maximum High: 1/4 inch.

5. Maximum Plumb Variation over the Lesser of Height of Structure or 100 Feet: 1 inch.
6. Plumb in Any 10 Feet of Element Height: 1/4 inch.
7. Maximum Jog in Alignment of Matching Edges: 1/4 inch.
8. Joint Width (Governs over Joint Taper): Plus or minus 1/4 inch.
9. Maximum Joint Taper: 3/8 inch.
10. Joint Taper in 10 Feet: 1/4 inch.
11. Maximum Jog in Alignment of Matching Faces: 1/4 inch.
12. Differential Bowing or Camber, as Erected, between Adjacent Members of Same Design: 1/4 inch.

3.4 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections.

B. Field welds and connections using high-strength bolts will be subject to tests and inspections.

C. Welding Inspection and Testing: In addition to visual inspection of all welds, welded connections will be inspected and tested by testing agency according to AWS D1.1 and the inspection procedures listed below.

   1. Magnetic Particle Inspection: ASTM E 709.
   2. Ultrasonic Inspection: ASTM E 164.
   3. Perform test on 100% of all full penetration welds, 25% of all partial penetration and field fillet welds and 5% of all shop welds using magnetic particle method or ultrasonic method. Engineer may reduce frequency of tests when initial test results were consistently within acceptable range.
   4. Cracks or zones of incomplete fusion or penetration will not be accepted.

D. Testing agency will report test results promptly and in writing to Contractor and Architect.

E. Remove and replace work that does not comply with specified requirements.

F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

G. Grouting will be subject to tests and inspections. The grout compression testing criteria and procedures are as listed below. The contractor must confirm the testing criteria and procedures with the manufacturer(s) of the grout(s) used on the project. The contractor must include the testing criteria and procedures with the grout submittals. The contractor shall provide the testing agency with the approved testing criteria and procedures.

   1. Make minimum 12 cubes (2 in. x 2in. x 2 in.) for each day’s grouting (6 cubes in the am and 6 cubes and in the pm.)

2. Cure cubes in accordance with ASTM C 192 and test in accordance with ASTM C 109. Test (2) cubes at 7 days, (2) cubes at 28 days and hold (2) cubes in reserve for future use as Engineer directs.

3.5 DEFECTS AND REPAIRS

A. Inspect and record any damages (crack, spalls, stains etc.) found on the precast members prior to shipping members. Inform Engineer of Record of defects and replace with precast concrete units that comply with requirements.

B. When defects are found after members are erected, the remedial procedure and details shall be submitted for Engineer’s approval and executed after approval. If remedial work is found to be unacceptable, members shall be removed and replaced.

C. Repair exposed exterior surfaces of precast architectural concrete units to match color, texture, and uniformity of surrounding precast architectural concrete if permitted by Architect.

D. Remove and replace damaged precast architectural concrete units if repairs do not comply with requirements.

3.6 CLEANING

A. Clean exposed surfaces of precast concrete units after erection to remove weld marks, other markings, dirt, and stains.

1. Wash and rinse according to precast concrete fabricator's written recommendations. Protect other work from staining or damage due to cleaning operations.
2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes.

END OF SECTION 034000

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Mortar and grout materials.
3. Reinforcement.
4. Ties and anchors.
5. Embedded flashing.
6. Mortar and grout mixes.

B. Products furnished, but not installed, under this Section include the following:

1. Dovetail slots for masonry anchors, installed under Division 3 Section "Cast-in-Place Concrete."
2. Anchor sections of adjustable masonry anchors for connecting to structural frame, installed under Division 5 Section "Structural Steel."

C. Products Installed but not Furnished under This Section:

1. Steel lintels and shelf angles for unit masonry, furnished under Division 5 Section "Metal Fabrications."
2. Manufactured reglets in masonry joints for metal flashing, furnished under Division 7 Section "Sheet Metal Flashing and Trim."

1.2 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops indicated net-area compressive strengths (f'_m) at 28 days.

B. Determine net-area compressive strength (f'_m) of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For the following:

1. Masonry Units: Indicate sizes, profiles, coursing, and locations of special shapes.
2. Reinforcing Steel: Indicate bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315R.
3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Initial Selection:

1. Decorative CMUs, in the form of small-scale units.
2. Colored mortar.

D. Samples for Verification: For each type and color of the following:

1. Exposed CMUs.
2. Pre-faced CMUs.
3. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.
4. Accessories embedded in masonry.

1.5 INFORMATIONAL SUBMITTALS

A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. Receipt of list does not constitute approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

B. Material Certificates: For each type of the following:

1. Masonry units.
    a. Include material test reports substantiating compliance with requirements.
    b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
2. Cementitious materials. Include name of manufacturer, brand name, and type.
3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
4. Grout mixes. Include description of type and proportions of ingredients.
5. Reinforcing bars.
6. Joint reinforcement.
7. Anchors, ties, and metal accessories.

C. Qualification Statements: For testing agency.

D. Delegated design engineer qualifications.

E. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test in accordance with ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
2. Include test reports, in accordance with ASTM C1019, for grout mixes required to comply with compressive strength requirement.

F. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined in accordance with TMS 602.

G. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1093 for testing indicated, as documented according to ASTM E 548.

B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.

D. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Payment for these services will be made by Owner. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.
1. Concrete Masonry Unit Test: For each type of unit required, per ASTM C 140.
2. Mortar Test (Property Specification): For each mix required, per ASTM C 780.
3. Grout Test (Compressive Strength): For each mix required, per ASTM C 1019.

E. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 FIELD CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.
2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe, and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. 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.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain exposed masonry units cementitious mortar components and mortar aggregate from single source manufacturer.

B. For exposed masonry units and cementitious mortar components, obtain each color and grade from single source with resources to provide materials of consistent quality in appearance and physical properties.

2.2 UNIT MASONRY, GENERAL

A. 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 ft. vertically and horizontally of a walking surface.

2.3 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.
2. Provide square-edged units for outside corners unless otherwise indicated.

B. Integral Water Repellent: Provide units made with integral water repellent for exposed units and where indicated.

1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested in accordance with ASTM E514/E514M as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, will show no visible water or leaks on the back of test specimen.

a. Available Products:

1) Addiment Incorporated; Block Plus W-10.

2) Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block.
3) Master Builders, Inc.; Rheopel.

C. CMUs: ASTM C90, normal weight unless otherwise indicated.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi.
2. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
3. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.

2.4 LINTELS

A. General: Provide either concrete or masonry lintels, at Contractor's option, complying with requirements below.

B. Concrete Lintels: Precast units made from concrete matching concrete masonry units in color, texture, and compressive strength and with reinforcing bars indicated or required to support loads indicated. Cure precast lintels by same method used for concrete masonry units.

C. Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Division 3 Section "Cast-in-Place Concrete."

D. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.5 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.

1. Alkali content will not be more than 0.1 percent when tested in accordance with ASTM C114.

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.

1. Available Products:

a. Capital Materials Corporation; Flamingo Color Masonry Cement.
b. Essroc, Italcementi Group; Brixment or Velvet.

c. Holcim (US) Inc.; Mortamix Masonry Cement Rainbow Mortamix Custom Buff Masonry Cement White Mortamix Masonry Cement.
d. Lafarge North America Inc.; Magnolia Masonry Cement Lafarge Masonry Cement Florida Super Masonry Trinity Super White Masonry Type S Trinity White Masonry Type N.
e. Lehigh Cement Company; Lehigh Masonry Cement Lehigh White Masonry Cement.
f. National Cement Company, Inc.; Coosa Masonry Cement.

E. Mortar Cement: ASTM C1329/C1329M.

1. Available Products:

a. Lafarge North America Inc.; Lafarge Mortar Cement or Magnolia Superbond Mortar Cement.

F. 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.

1. Available Products:

a. Bayer Corporation, Industrial Chemicals Div.; Bayferrox Iron Oxide Pigments.
b. Davis Colors; True Tone Mortar Colors.
c. Solomon Grind-Chem Services, Inc.; SGS Mortar Colors.

G. Aggregate for Mortar: ASTM C144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

H. Aggregate for Grout: ASTM C404.

I. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

1. Available Products:

a. Addiment Incorporated; Mortar Kick.
b. Euclid Chemical Company (The); Accelguard 80.
c. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Morset.
d. Sonneborn, Div. of ChemRex; Trimix-NCA.

J. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.

1. Available Products:

    a. Addiment Incorporated; Mortar Tite.
    b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.
    c. BASF Building Systems; Color Cure Mortar Admix or Rheomix Rheopel.

K. Water: Potable.

2.6 REINFORCEMENT

A. Uncoated-Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60.

B. Masonry-Joint Reinforcement, General: ASTM A951/A951M.

1. Interior Walls: Hot-dip galvanized carbon steel.
2. Exterior Walls: Hot-dip galvanized carbon steel.
3. Wire Size for Side Rods: 0.187-inch diameter.
4. Wire Size for Cross Rods: 0.187-inch diameter.
5. Wire Size for Veneer Ties: 0.187-inch diameter.
6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
7. Provide in lengths of not less than 10 ft., with prefabricated corner and tee units.

C. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder or truss type with single pair of side rods.

2.7 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:

1. Mill-Galvanized, Carbon-Steel Wire: ASTM A1064/A1064M, with ASTM A641/A641M, Class 1 coating.
2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A1064/A1064M, with ASTM A153/A153M, Class B-2 coating.
3. Stainless Steel Wire: ASTM A580/A580M, Type 316.
4. Galvanized-Steel Sheet: ASTM A653/A653M, Commercial Steel, G60 zinc coating.
5. Steel Sheet, Galvanized after Fabrication: ASTM A1008/A1008M, Commercial Steel, with ASTM A153/A153M, Class B coating.
6. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 316.
7. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
8. Stainless Steel Bars: ASTM A276 or ASTM A666, Type 304.

B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.

C. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.062-inch-thick, stainless steel sheet.

    a. 0.064-inch- thick, galvanized-steel sheet may be used at interior walls unless otherwise indicated.

2. Tie Section: Triangular-shaped wire tie made from 0.25-inch- diameter, hot-dip galvanized steel wire.
3. Corrugated-Metal Ties: Metal strips not less than 7/8 inch wide with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch made from 0.1084-inch-thick steel sheet, galvanized after fabrication with dovetail tabs for inserting into slots in concrete.

    a. 0.108-inch- thick galvanized sheet may be used at interior walls unless otherwise indicated.

D. Partition Top Anchors: 0.105-inch-thick metal plate with a 3/8-inch-diameter metal rod 6 inches 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.

E. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated.

1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A153/A153M.

2.8 MISCELLANEOUS ANCHORS

A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron wedge-type inserts.

B. Dovetail Slots in Concrete: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.034-inch, galvanized steel sheet.

C. Anchor Bolts: Headed or L-shaped steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

D. Postinstalled Anchors: Provide chemical or torque-controlled expansion anchors, with capability to sustain, without failure, a load equal to six times the load imposed when installed in solid or grouted unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns) for Class SC 1 service condition (mild).
2. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 for bolts and nuts; ASTM A 666 or ASTM A 276, Type 304 or 316, for anchors.

2.9 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing, where flashing is exposed or partly exposed and where indicated, complying with Division 7 Section "Sheet Metal Flashing and Trim" and as follows:

1. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.016 inch thick.
2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
3. Fabricate through-wall metal flashing embedded in masonry from stainless steel, with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.

    a. Available Products:

        1) Cheney Flashing Company; Cheney Flashing (Dovetail) or Cheney 3-Way Flashing (Sawtooth).
        2) Keystone Flashing Company, Inc.; Keystone 3-Way Interlocking Thruwall Flashing.
4. Fabricate through-wall flashing with drip edge where indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
5. Fabricate through-wall flashing with sealant stop where indicated. Fabricate by bending metal back on itself 3/4 inch at exterior face of wall and down into joint 3/8 inch to form a stop for retaining sealant backer rod.
6. Fabricate metal drip edges and sealant stops for ribbed metal flashing from plain metal flashing of same metal as ribbed flashing and extending at least 3 inches into wall with hemmed inner edge to receive ribbed flashing and form a hooked seam. Form hem on upper surface of metal so that completed seam will shed water.
7. Metal Drip Edges: Fabricate from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
8. Metal Flashing Terminations: Fabricate from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and down into joint 3/8 inch to form a stop for retaining sealant backer rod.
9. Metal Expansion-Joint Strips: Fabricate from stainless steel to shapes indicated.

B. Single-Wythe CMU Flashing System: System of CMU cell flashing pans and interlocking CMU web covers made from high-density polyethylene incorporating chemical stabilizers that prevent UV degradation. Cell flashing pans have integral weep spouts that are designed to be built into mortar bed joints and weep collected moisture to the exterior of CMU walls and that extend into the cell to prevent clogging with mortar.

1. Product: Subject to compliance with requirements, provide "Blok-Flash" by Advanced Building Products Inc.

C. Solder and Sealants for Sheet Metal Flashings: As specified in Division 7 Section "Sheet Metal Flashing and Trim."

D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.10 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, 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, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Weep/Vent Products: Use the following, unless otherwise indicated:
1. Round Plastic Weep/Vent Tubing: Medium-density polyethylene, 3/8-inch OD by 4 inches long.

a. Available Products:

1) Advanced Building Products Inc.; Mortar Maze weep vent.
2) Dayton Superior Corporation, Dur-O-Wal Division; Cell Vents.
3) Heckmann Building Products Inc.; No. 85 Cell Vent.
4) Hohmann & Barnard, Inc.; Quadro-Vent.
5) Wire-Bond; Cell Vent.

E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

1. Provide one of the following configurations:

a. Strips, full-depth of cavity and 10 inches wide, with dovetail shaped notches 7 inches deep that prevent mesh from being clogged with mortar droppings.
b. Strips, not less than 3/4 inch thick and 10 inches wide, with dimpled surface designed to catch mortar droppings and prevent weep holes from being clogged with mortar.
c. Sheets or strips full depth of cavity and installed to full height of cavity.
d. Sheets or strips not less than 3/4 inch thick and installed to full height of cavity with additional strips 4 inches high at weep holes and thick enough to fill entire depth of cavity and prevent weep holes from being clogged with mortar.

2. Available Products:

a. Advanced Building Products Inc.; Mortar Break Mortar Break II.
b. Archovations, Inc.; CavClear Masonry Mat.
c. Dayton Superior Corporation, Dur-O-Wal Division; Polytite MortarStop.
d. Mortar Net USA, Ltd.; Mortar Net.

F. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.142-inch steel wire, hot-dip galvanized after fabrication. Provide units with either two loops or four loops as needed for number of bars indicated.

1. Available Products:

    a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
    b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
    c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
    d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

2.11 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Available Manufacturers:

    a. Diedrich Technologies, Inc.
    b. EaCo Chem, Inc.
    c. ProSoCo, Inc.

2.12 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.
1. Limit cementitious materials in mortar to portland cement, mortar cement, and lime.
2. 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 mortar parge coats, use Type S.
4. For exterior, above-grade, load-bearing, 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.
5. For interior nonload-bearing partitions, Type O may be used instead of Type N.

D. Grout for Unit Masonry: Comply with ASTM C476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 11 inches as measured in accordance with ASTM C143/C143M.

PART 3 - EXECUTION

3.1 EXAMINATION

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

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

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

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.

D. 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.

E. 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.

F. Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:

1. 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, 1/4 inch in 20 feet, or 1/2 inch maximum.

2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
3. 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, 1/4 inch in 20 feet, or 1/2 inch maximum.
4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
6. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.
7. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

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 horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

I. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.
2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors, and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
3. Wedge nonload-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078443 "Joint Firestopping."

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.
5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.

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.

1. For glazed masonry units, use a nonmetallic jointer 3/4 inch or more in width.

D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.5 MASONRY-JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.

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.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at[**corners,**] returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.6 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 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 o.c. vertically and 36 inches o.c. horizontally.

3.7 CONTROL AND EXPANSION JOINTS

A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry using one of the following methods:

1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout, and rake out joints in exposed faces for application of sealant.
2. Install preformed control-joint gaskets designed to fit standard sash block.
3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar, or rake out joint for application of sealant.
4. Install temporary foam-plastic filler in head joints, and remove filler when unit masonry is complete for application of sealant.

C. Provide horizontal, pressure-relieving joints by either leaving an airspace or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 079200 "Joint Sealants," but not less than 3/8 inch.

1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.8 LINTELS

A. Install steel lintels where indicated.

B. Provide masonry lintels where indicated and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are indicated without structural steel or other supporting lintels.

C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.9 FLASHING, WEEP HOLES, AND CAVITY VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. At lintels and shelf angles, extend flashing 6 inches minimum at each end. At heads and sills, extend flashing 6 inches minimum and turn ends up not less than 2 inches to form end dams.
3. Interlock end joints of sawtooth sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
4. Install metal drip edges and sealant stops with sawtooth sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
5. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to top of metal drip edge.
6. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to top of metal flashing termination.
7. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.

C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.

D. Install reglets and nailers for flashing and other related construction where they are indicated to be built into masonry.

E. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.

1. Use specified weep/cavity vent products or open-head joints to form weep holes.
2. Use wicking material to form weep holes above flashing under brick sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
3. Space weep holes 24 inches o.c. unless otherwise indicated.

4. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.
5. Trim wicking material flush with outside face of wall after mortar has set.

F. Place pea gravel in cavities as soon as practical to a height equal to height of first course above top of flashing, but not less than 2 inches, to maintain drainage.

1. Fill cavities full height by placing pea gravel in cavities as masonry is laid, so that at any point, masonry does not extend more than 24 inches above top of pea gravel.

G. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Accessories" Article.

H. Install cavity vents in head joints in exterior wythes at spacing indicated. Use specified weep/cavity vent products or open-head joints to form cavity vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.10 REINFORCED UNIT MASONRY

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches.

3.11 FIELD QUALITY CONTROL

A. Inspectors: Owner will engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.

1. Place grout only after inspectors have verified compliance of grout spaces and grades, sizes, and locations of reinforcement.

B. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports:

1. Payment for these services will be made by Owner.
2. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.

C. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

D. Concrete Masonry Unit Test: For each type of unit provided, per ASTM C 140.

E. Mortar Test (Property Specification): For each mix provided, per ASTM C 780. Test mortar for mortar air content and compressive strength.

F. Grout Test (Compressive Strength): For each mix provided, per ASTM C 1019.

3.12 PARGING

A. Parge exterior faces of below-grade masonry walls, where indicated, in two uniform coats to a total thickness of 3/4 inch. Dampen wall before applying first coat, and scarify first coat to ensure full bond to subsequent coat.

B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot. Form a wash at top of parging and a cove at bottom.

C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.13 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. 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. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.

3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.14 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. 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. Crush masonry waste to less than 4 inches in each dimension.
2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 312000 "Earth Moving."
3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

C. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.

D. 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 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural steel.
2. Shrinkage-resistant grout.

1.2 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

1.3 COORDINATION

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

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Structural-steel materials.
2. High-strength, bolt-nut-washer assemblies.
3. Anchor rods.
4. Threaded rods.
5. Shop primer.
6. Shrinkage-resistant grout.

B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment Drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.

5. Identify members not to be shop primed.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installer, fabricator, and testing agency.

B. Welding certificates.

C. Mill test reports for structural-steel materials, including chemical and physical properties.

D. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172).

B. Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.

C. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with applicable provisions of the following specifications and documents:

1. ANSI/AISC 303.
2. ANSI/AISC 360.
3. RCSC's "Specification for Structural Joints Using High-Strength Bolts."

B. Connection Design Information:

1. Connection designs have been completed and connections indicated on the Drawings.

C. Moment Connections: Type FR, fully restrained.

D. Construction: Combined system of moment frame and shear walls

2.2 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A992 Grade 50

B. Channels, Angles: ASTM A36

C. Plate and Bar: ASTM A36

D. Hollow Structural Sections, Square or Rectangular: ASTM A500, Grade C

E. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS AND CONNECTORS

A. Zinc-Coated High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436, Type 1, hardened carbon-steel washers.

1. Finish: Hot-dip zinc coating
2. Direct-Tension Indicators: ASTM F959, Type 325-1, compressible-washer type with mechanically deposited zinc coating

2.4 RODS

A. Headed or Unheaded Anchor Rods: ASTM F1554, Grade 55

1. Configuration: Straight.
2. Nuts: ASTM A563 heavy-hex carbon steel.
3. Plate Washers: ASTM A36 carbon steel.
4. Washers: ASTM F436, Type 1, hardened carbon steel.
5. Finish: Hot-dip zinc coating, ASTM A153, Class C.

B. Threaded Rods: ASTM A36

1. Nuts: ASTM A563 heavy-hex carbon steel.
2. Washers: ASTM F436, Type 1, hardened carbon steel.
3. Finish: Hot-dip zinc coating, ASTM A153, Class C.

2.5 PRIMER

A. Steel Primer:
   1. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

2.6 SHRINKAGE-RESISTANT GROUT

A. Metallic, Shrinkage-Resistant Grout: ASTM C1107, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.

2.7 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.

   1. Camber structural-steel members where indicated.
   2. Fabricate beams with rolling camber up.
   3. Identify high-strength structural steel in accordance with ASTM A6 and maintain markings until structural-steel framing has been erected.
   4. Mark and match-mark materials for field assembly.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

   1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.

C. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

D. Cleaning: Clean and prepare steel surfaces that are to remain unpainted in accordance with SSPC-SP 2.

E. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural-steel frame. Straighten as required to provide uniform, square, and true members in completed wall framing. Build up welded framing, weld exposed joints continuously, and grind smooth.

F. Welded-Steel Door Frames: Build up welded-steel door frames attached to structural-steel frame. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk machine screws, uniformly spaced not more than 10 inches o.c. unless otherwise indicated on Drawings.

G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.

   1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
   2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
   3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.8 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened, typical. Pretensioned at moment connections.

2.9 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123.

1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.

2.10 SHOP PRIMING

A. Shop prime steel surfaces, except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces of high-strength bolted, slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces.
6. Corrosion-resisting (weathering) steel surfaces.
7. Surfaces enclosed in interior construction.

B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:

1. SSPC-SP 2.

C. Surface Preparation of Galvanized Steel: Prepare galvanized-steel surfaces for shop priming by thoroughly cleaning steel of grease, dirt, oil, flux, and other foreign matter, and treating with etching cleaner.

D. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

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

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated on Drawings.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.

B. Baseplates, Bearing Plates and Leveling Plates: Clean concrete-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for grouting.

C. Maintain erection tolerances of structural steel within ANSI/AISC 303.

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.

E. Splice members only where indicated.

F. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.

1. Joint Type: Snug tightened, typical. Pretensioned at moment connections.
2. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

3.5 REPAIR

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with ASTM A780.

3.6 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform the following special inspections:

1. Verify structural-steel materials and inspect steel frame joint details.
2. Verify weld materials and inspect welds.
3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

1. Bolted Connections: Inspect and test bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1.

    a. In addition to visual inspection, test and inspect field welds in accordance with AWS D1.1 and the following inspection procedures, at testing agency's option:

        1) Liquid Penetrant Inspection: ASTM E165.
        2) Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
        3) Ultrasonic Inspection: ASTM E164.
        4) Radiographic Inspection: ASTM E94.

END OF SECTION 051200

SECTION 054000 - COLD-FORMED METAL FRAMING

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. Load-bearing wall framing.
2. Exterior non-load-bearing wall framing.
3. Interior non-load-bearing wall framing.
4. Ceiling joist framing.
5. Soffit framing.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for miscellaneous steel shapes, masonry shelf angles, and connections used with cold-formed metal framing.
2. Section 092216 "Non-Structural Metal Framing" for standard, interior non-load bearing, metal-stud framing, with height limitations and ceiling-suspension assemblies.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Cold-formed steel framing materials.
2. Load-bearing wall framing.
3. Exterior non-load-bearing wall framing.
4. Interior non-load-bearing wall framing.
5. Vertical deflection clips.
6. Single deflection track.
7. Double deflection track.
8. Drift clips.
9. Ceiling joist framing.
10. Post-installed anchors.
11. Power-actuated anchors.

B. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.

2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

C. Delegated-Design Submittal: For cold-formed steel framing.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of code-compliance certification for studs and tracks.

B. Research Reports:

1. For nonstandard cold-formed steel framing post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.
2. For sill sealer gasket/termite barrier, showing compliance with ICC-ES AC380.

1.5 QUALITY ASSURANCE

A. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Marino-Ware Industries

B. ClarkDietrich

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.

B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated on Drawings
2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
   a. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height under a horizontal load of 5 lbf/sq.ft.
   b. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/600 of the wall height.

c. Interior Non-Load-Bearing Framing: Horizontal deflection of 1/360 of the wall height under a horizontal load of 5 lbf/sq.ft..
d. Ceiling Joist Framing: Vertical deflection of 1/180 of the span for live loads and 1/240 for total loads of the span.

3. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
a. Upward and downward movement of 1/2 inch.

C. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing shall comply with AISI S100, AISI S200, and the following:
1. Wall Studs: AISI S211.
2. Headers: AISI S212.
3. Lateral Design: AISI S213.

2.3 COLD-FORMED STEEL FRAMING MATERIALS

A. Steel Sheet: ASTM A1003, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:

1. Grade: ST33H & ST50H
2. Coating: G60

B. Steel Sheet for Vertical Deflection and Drift Clips: ASTM A653, structural steel, zinc coated, of grade and coating as follows:

1. Grade: 33, Class 1
2. Coating: G60

2.4 LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329 inch
2. Flange Width: 1-5/8 inches

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329 inch
2. Flange Width: 1-1/4 inches

C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0677 inch
2. Flange Width: 2 inches

2.5 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329 inch
2. Flange Width: 1-5/8 inches

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329 inch
2. Flange Width: 1-1/4 inches

C. Vertical Deflection Clips: Manufacturer's standard head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
1. Marino-Ware Industries
2. ClarkDietrich

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:

1. Minimum Base-Metal Thickness: 0.0677 inch
2. Flange Width: 1 inch plus the design gap for one-story structures

E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:

a. Minimum Base-Metal Thickness: 0.0677 inch
b. Flange Width: 1 inch plus the design gap for one-story structures

2. Inner Track: Of web depth indicated, and as follows:

a. Minimum Base-Metal Thickness: 0.0677 inch
b. Flange Width: 2 1/2 inch

F. Drift Clips: Manufacturer's standard head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.6 INTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329 inch
2. Flange Width: 1-5/8 inches

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329 inch
2. Flange Width: 1-1/4 inches

C. Vertical Deflection Clips: Manufacturer's standard head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
1. Marino-Ware Industries
2. ClarkDietrich

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:

1. Minimum Base-Metal Thickness: 0.0677 inch
2. Flange Width: 1 inch plus the design gap for one-story structures

E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:

a. Minimum Base-Metal Thickness: 0.0677 inch
b. Flange Width: 1 inch plus the design gap for one-story structures

2. Inner Track: Of web depth indicated, and as follows:

a. Minimum Base-Metal Thickness: 0.0677 inch
b. Flange Width: 2 1/2 inch

F. Drift Clips: Manufacturer's standard head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.7 CEILING JOIST FRAMING

A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, punched with standard holes, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329 inch or 0.0677 inch per plans
2. Flange Width: 1-5/8 inches or 2 inches per plans.

2.8 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from ASTM A1003, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers and knee braces.
9. Joist hangers and end closures.
10. Hole-reinforcing plates.
11. Backer plates.

2.9 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A36, zinc coated by hot-dip process according to ASTM A123.

B. Anchor Bolts: ASTM F1554, Grade 55, threaded carbon-steel hex-headed bolts, carbon-steel nuts, and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A153, Class C

C. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308 as appropriate for the substrate.

1. Uses: Securing cold-formed steel framing to structure.
2. Type: adhesive anchor.
3. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.

D. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

E. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.

1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.10 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

    a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings, with screws penetrating joined members by no fewer than three exposed screw threads.

4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.

C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, conditions, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Install load-bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.

B. Install sill sealer gasket at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

C. Install sill sealer gasket/termite barrier in accordance with manufacturer's written instructions at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

    a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners, install according to Shop Drawings, and comply with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Install insulation, specified in Section 072100 "Thermal Insulation," in framing-assembly members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

H. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.4 INSTALLATION OF LOAD-BEARING WALL FRAMING

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:

1. Anchor Spacing: 32 inches

B. Squarely seat studs against top and bottom tracks, with gap not exceeding 1/8 inch between the end of wall-framing member and the web of track.

1. Fasten both flanges of studs to top and bottom tracks.
2. Space studs as follows:

a. Stud Spacing: 16 inches

C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar configurations.

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align floor and roof framing over studs according to AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads.

F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure.

G. Install headers over wall openings wider than stud spacing. Locate headers above openings. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame. Fasten jamb members together to uniformly distribute loads.
2. Install tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

I. Install horizontal bridging in stud system, spaced vertically 48 inches. Fasten at each stud intersection.

1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 6 inches deep.
2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges, and secure solid blocking to stud webs or flanges.

J. Install steel sheet diagonal bracing straps to both stud flanges; terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 INSTALLATION OF EXTERIOR NONLOADBEARING WALL FRAMING

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.

B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:

1. Stud Spacing: 16 inches

C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single deep-leg deflection tracks and anchor to building structure.
2. Install double deep-leg deflection tracks and anchor outer track to building structure.

E. Install horizontal bridging in wall studs, spaced vertically in rows indicated but not more than 48 inches apart. Fasten at each stud intersection.

1. Channel Bridging: Cold-rolled steel channel welded or mechanically fastened to webs of punched studs.
2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.

1. Install solid blocking at 96-inch centers

G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.6 INSTALLATION OF INTERIOR NONLOADBEARING WALL FRAMING

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.

B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:

1. Stud Spacing: 16 inches

C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single deep-leg deflection tracks and anchor to building structure.
2. Install double deep-leg deflection tracks and anchor outer track to building structure.

E. Install horizontal bridging in wall studs, spaced vertically in rows indicated but not more than 48 inches apart. Fasten at each stud intersection.

1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.

1. Install solid blocking at 96-inch centers

G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.7 INSTALLATION OF JOIST FRAMING

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated

B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.

1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches
2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections.

C. Space joists not more than 2 inches from abutting walls, and as follows:

1. Joist Spacing: 16 inches

D. Frame openings with built-up joist headers, consisting of joist and joist track or another combination of connected joists if indicated.

E. Install bridging at intervals indicated. Fasten bridging at each joist intersection as follows:

1. Joist-Track Solid Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
2. Combination Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.

F. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

G. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.8 INSTALLATION TOLERANCES

A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.9 REPAIR

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A780 and manufacturer's written instructions.

3.10 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.11 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

SECTION 055000 - METAL FABRICATIONS FOR GARAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Steel framing and supports for mechanical and electrical equipment.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Elevator machine beams, hoist beams, and divider beams.
4. Support angles for elevator door sills.
5. Shelf angles.
6. Loose bearing and leveling plates.
7. Steel weld plates and angles for casting into concrete not specified in other Sections.
8. Miscellaneous steel trim.
9. Metal ladders.
10. Ladder safety cages.
11. Elevator pit sump covers.
12. Metal bollards.
13. Pipe and downspout guards.
14. Bicycle racks.
15. Abrasive metal nosings treads and thresholds.
16. Security fencing.
17. Pedestrian guardrail / vehicular barrier.

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

C. Related Sections include the following:

1. Division 3 Sections "Cast-in-Place Concrete" and “Precast Concrete” for installing anchor bolts, steel pipe sleeves, wedge-type inserts and other items indicated to be cast into concrete.
2. Division 3 Section "Precast Concrete" for plant cast concrete that provides support for metal fabrications, including the barrier cable system.

3. Division 4 Section "Unit Masonry " for installing loose lintels, anchor bolts, and other items indicated to be built into unit masonry.
4. Division 5 Section "Structural Steel."
5. Division 5 Section "Pipe and Tube Railings."
6. Division 5 Section "Gratings."
7. Division 6 Section "Rough Carpentry" for metal framing anchors.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Nonslip aggregates and nonslip-aggregate surface finishes.
2. Abrasive metal nosings, treads, and thresholds.
3. Paint products.
4. Shrinkage-resisting grout.
5. Fasteners.
6. Shop primers.
7. Manufactured metal ladders.
8. Metal bollards.
9. Pipe and downspout guards.
10. Metal downspout boots.

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

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
2. Provide templates for anchors and bolts specified for installation under other Sections.
3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

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

D. Delegated Design Submittals: For ladders, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Mill Certificates: Signed by manufacturers of stainless-steel sheet certifying that products furnished comply with requirements.

B. Welding certificates.

C. Research Reports: For post-installed anchors.

D. Qualification Data: For professional engineer.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.2, "Structural Welding Code--Aluminum."
3. AWS D1.3, "Structural Welding Code--Sheet Steel."
4. AWS D1.6, "Structural Welding Code--Stainless Steel."

1.6 PROJECT CONDITIONS

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

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
2. Provide allowance for trimming and fitting at site.

1.7 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. 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 or precast concrete plant in time for installation.

B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project site or precast concrete plant in time for installation. Refer to Division 3 Section "Precast Concrete" for embeds that are provided by the precaster, such as embedded plates for the barrier cable system.

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

B. Structural Performance of Ladders: Provide ladders capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

C. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. 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.

2.2 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Products: Subject to compliance with requirements, provide one of the products specified.
3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.3 METALS, GENERAL

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

2.4 FERROUS METALS

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

B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.

C. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.

D. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

E. Rolled-Stainless-Steel Floor Plate: ASTM A 793.

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

G. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

H. Cast Iron: ASTM A 48/A 48M, Class 30, unless another class is indicated or required by structural loads.

I. Refer to Division 5 Section "Structural Steel" corrosion resistant steel materials.

2.5 NONFERROUS METALS

A. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.

B. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.

C. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.

D. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

2.6 FASTENERS

A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and, where indicated, flat washers; ASTM F 593 for bolts and ASTM F 594 for nuts, Alloy Group 2.

D. Anchor Bolts: ASTM F 1554, Grade 36, hot-dipped galvanized.

1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.

E. Eyebolts: ASTM A 489.

F. Machine Screws: ASME B18.6.3.

G. Lag Bolts: ASME B18.2.1.

H. Wood Screws: Flat head, ASME B18.6.1.

I. Plain Washers: Round, ASME B18.22.1.

J. Lock Washers: Helical, spring type, ASME B18.21.1.

K. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

L. Post-Installed Anchors: Torque-controlled expansion anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 2 (A4) stainless steel bolts, ASTM F593 (ISO 3506-1), and nuts, ASTM F594 (ASTM F836M).

M. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material for Anchors in Exterior Locations: Alloy Group 2 stainless-steel bolts complying with ASTM F 593 and nuts complying with ASTM F 594.

2.7 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.

1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

C. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20. The galvanizing repair paint must match the color of the hot-dip galvanized finish; provide a mockup for confirmation.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

F. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.

2.8 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain

structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

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

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

D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.

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

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

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

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

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

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

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.9 MISCELLANEOUS FRAMING AND SUPPORTS

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

B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

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

C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

D. Fabricate steel girders for wood frame construction from continuous steel shapes of sizes indicated.

1. Provide bearing plates welded to beams where indicated.
2. Drill girders and plates for field-bolted connections where indicated.
3. Where wood nailers are attached to girders with bolts or lag screws, drill holes at 24 inches o.c.

E. Fabricate steel pipe columns for supporting wood frame construction from steel pipe with steel baseplates and top plates as indicated. Drill baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness, unless otherwise indicated.

1. Unless otherwise indicated, fabricate from Schedule 40 steel pipe.
2. Unless otherwise indicated, provide 1/2-inch baseplates with four 5/8-inch anchor bolts and 1/4-inch top plates.

F. Galvanize miscellaneous framing and supports where indicated.

2.10 LOOSE STEEL LINTELS

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

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches, unless otherwise indicated.

C. Galvanize and prime loose steel lintels located in exterior walls.

D. Prime loose steel lintels located in exterior walls with primer specified in Section 099600 "High-Performance Coatings."

2.11 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.

1. Provide mitered and welded units at corners.
2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

C. Galvanize and prime shelf angles located in exterior walls.

D. Prime shelf angles located in exterior walls with primer specified in Section 099600 "High-Performance Coatings."

E. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.12 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates after fabrication.

C. Prime plates with primer specified in Section 099600 "High-Performance Coatings."

2.13 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with not less than two integrally welded steel strap anchors for embedding in concrete.

2.14 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize exterior miscellaneous steel trim and interior miscellaneous steel trim, where indicated.

D. Prime exterior miscellaneous steel trim with primer specified in Section 099600 "High-Performance Coatings."

2.15 METAL LADDERS

A. General:

1. Comply with ANSI A14.3, unless otherwise indicated.
2. For elevator pit ladders, comply with ASME A17.1.
3. Space siderails 16 inches apart, unless otherwise indicated.
4. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted brackets, made from same metal as ladder.

5. Siderails: Continuous, 3/8-by-2-1/2-inch steel flat bars, with eased edges.
6. Rungs: 3/4-inch- diameter steel bars.
7. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
8. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung by a proprietary process.
9. Available Products:

    a. IKG Industries, a Harsco company; Mebac.
    b. W. S. Molnar Company; SlipNOT.

10. Galvanize exterior ladders and interior ladders, where indicated, including brackets and fasteners.

B. Aluminum Ladders:

1. Siderails: Continuous extruded-aluminum channels or tubes, not less than 2-1/2 inches deep, 3/4 inch wide, and 1/8 inch thick.
2. Rungs: Extruded-aluminum tubes, not less than 3/4 inch deep and not less than 1/8 inch thick, with ribbed tread surfaces.
3. Fit rungs in centerline of siderails; fasten by welding or with stainless-steel fasteners or brackets and aluminum rivets.

2.16 LADDER SAFETY CAGES

A. General:

1. Fabricate ladder safety cages to comply with ANSI A14.3. Assemble by welding or with stainless-steel fasteners.
2. Provide primary hoops at tops and bottoms of cages and spaced not more than 20 feet o.c. Provide secondary intermediate hoops spaced not more than 48 inches o.c. between primary hoops.
3. Fasten assembled safety cage to ladder rails and adjacent construction by welding or with stainless-steel fasteners, unless otherwise indicated.

B. Steel Ladder Safety Cages:

1. Primary Hoops: 1/4-by-4-inch flat bar hoops.
2. Secondary Intermediate Hoops: 1/4-by-2-inch flat bar hoops.
3. Vertical Bars: 3/16-by-1-1/2-inch flat bars secured to each hoop.
4. Galvanize exterior ladder cages and interior ladder cages, where indicated, including fasteners.

C. Aluminum Ladder Safety Cages:

1. Primary Hoops: 1/4-by-4-inch flat bar hoops.
2. Secondary Intermediate Hoops: 1/4-by-2-inch flat bar hoops.
3. Vertical Bars: 1/4-by-2-inch flat bars secured to each hoop.

2.17 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 80 stainless steel, steel shapes, as indicated.

1. Where bollards are indicated to receive push-button controls for door operators, provide necessary cutouts for push-button controls and hole for wire.
2. Where bollards are indicated to receive light fixtures, provide cutouts for fixtures and holes for wire.

B. Fabricate bollards with 1/2-inch- thick steel baseplates for bolting to concrete slab. Drill baseplates at all 4 corners for 3/4-inch anchor bolts.

1. Where bollards are to be anchored to sloping concrete slabs, angle baseplates for plumb alignment of bollards.

C. Prime steel bollards with primer specified in Section 099600 "High-Performance Coatings."

2.18 PIPE AND DOWNSPOUT GUARDS

A. Fabricate pipe guards from 3/8-inch- thick by 12-inch- wide steel plate, bent to fit flat against the wall or column at both ends and to fit around pipe with 2-inch clearance between pipe and pipe guard. Drill each end for two 3/4-inch anchor bolts.

B. Prime steel pipe guards with primer specified in Section 099600 "High-Performance Coatings."

2.19 BICYCLE RACKS

A. Fabricate from Schedule 40 steel pipe, fully welded together, to lengths indicated.

B. Fabricate with NPS 3 top rails and end posts, NPS 1-1/2 bottom rails and intermediate posts not more than 72 inches o.c., and NPS 3/4 vertical separators at approximately 8 inches o.c.

C. Make top rails 36 inches above pavement/floor and bottom rails 4 inches above pavement/floor.

D. Fabricate end posts and intermediate posts with 1/4-inch- thick steel baseplates for bolting to concrete slab. Drill end post baseplates at all 4 corners and intermediate-post baseplates at 2 opposite sides for 1/2-inch anchor bolts.

E. Vertical Hung Space Saver Bike Racks

1. Acceptable Manufacturers

a. Provide bicycle racks manufactured by DERO BIKE RACK CO., 504 Malcolm Avenue SE, Suite 100, Minneapolis, MN 55414, 1-888-337-6729. Fax: 612-331-2731 Website: www.dero.com

2. Basis of Design Product

a. Dero Hoop Rack Heavy Duty

1) floor mounted bike racks two 2.5”x6”x.25” feet with two anchors per foot. Tamper-resistant fasteners

3. Materials
a. 2” schedule 40 pipe (2.375” OD)

F. Galvanize bicycle racks after fabrication.

G. Prime bicycle racks with zinc-rich primer.

2.20 ABRASIVE METAL NOSINGS TREADS AND THRESHOLDS

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

1. Available Manufacturers:

a. ACL Industries, Inc.
b. American Safety Tread Co., Inc.
c. Amstep Products.
d. Armstrong Products, Inc.
e. Balco Inc.
f. Granite State Casting Co.
g. Wooster Products Inc.

2. Provide ribbed units, with abrasive filler strips projecting 1/16 inch above aluminum extrusion.

B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

C. Drill for mechanical anchors and countersink. Locate not more than 4 inches from ends and not more than 12 inches o.c., evenly spaced between ends, unless otherwise indicated. Provide closer spacing if recommended by manufacturer.

1. Provide 2 rows of holes for units more than 5 inches wide, with 2 holes aligned at ends and intermediate holes staggered.

D. Apply bituminous paint to concealed bottoms, sides, and edges of cast-metal units set into concrete.

2.21 METAL DOWNSPOUT BOOTS

A. Provide downspout boots made from cast aluminum in heights indicated with inlets of size and shape to suit downspouts.

1. Outlet: Vertical, to discharge into pipe.

2.22 FINISHES, GENERAL

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

B. Finish metal fabrications after assembly.

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

2.23 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

2. Zinc high spots, such as a metal drip line, should be removed by cleaning with hand or power tools as described in SSPC Surface Preparation Specification 2 or 3. The zinc should be removed until it is level with the surrounding area, taking care that the base coating is not removed by the cleaning methods.

3. After cleaning, the surface shall be inspected for conformance to the required zinc thickness in accordance with ASTM A 123/A 123M or A 153/A 153M utilizing a magnetic-field-type thickness instrument in accordance with ASTM E 376. Any item falling below the required zinc thickness, before or after removal of any high spots, shall be repaired in accordance with ASTM A 780.

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

1. Shop prime unless primers specified in Section 09960 "High-Performance Coatings" are indicated.

2.24 STAINLESS-STEEL FINISHES

A. Remove tool and die marks and stretch lines or blend into finish.

B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. Bright, Directional Satin Finish: No. 4.

D. Dull Satin Finish: No. 6.

E. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.25 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Mechanical Finish: AA-M12 (Mechanical Finish: nonspecular as fabricated).

C. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

D. Class I, Color Anodic Finish: AA-M12C22A42/A44 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.
   1. Color: As selected by Architect from full range of industry colors and color densities.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

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

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

C. Field Welding: Comply with the following requirements:

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

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

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

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

B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.

1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.3 INSTALLATION OF SHELF ANGLES

A. Install shelf angles as required to keep masonry level, at correct elevation, and flush with vertical plane.

3.4 INSTALLATION OF METAL LADDERS

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

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

3.5 INSTALLATION OF ELEVATOR PIT SUMP COVERS

A. Install tops of elevator sump pit cover plates and frames flush with finished surface. Adjust as required to avoid lippage that could present a tripping hazard.

3.6 INSTALLATION OF MISCELLANEOUS STEEL TRIM

A. Anchor to concrete construction to comply with manufacturer's written instructions.

3.7 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.8 INSTALLING METAL BOLLARDS

A. Anchor bollards to existing construction with expansion anchors. Provide four 3/4-inch bolts at each bollard, unless otherwise indicated.

1. Embed anchor bolts at least 4 inches in concrete.

A. Fill bollards solidly with concrete, mounding top surface to shed water.

1. Do not fill removable bollards with concrete.

3.9 INSTALLING PIPE AND DOWNSPOUT GUARDS

A. Provide pipe guards at exposed vertical pipes in parking garage where not protected by curbs or other barriers. Install by bolting to wall or column with expansion anchors. Provide four 3/4-inch bolts at each pipe guard. Mount pipe guards with top edge 26 inches above driving surface.

3.10 INSTALLING BICYCLE RACKS

A. . Anchor bicycle racks to existing construction with expansion anchors based on bicycle rack manufacturer’s requirements.

3.11 INSTALLING NOSINGS, TREADS, AND THRESHOLDS

A. Center nosings on tread widths.

B. For nosings embedded in concrete steps or curbs, align nosings flush with riser faces and level with tread surfaces.

C. Seal thresholds exposed to exterior with elastomeric sealant complying with Division 7 Section "Joint Sealants" to provide a watertight installation.

3.12 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint that are specified in Division 9 painting Sections. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Use applicators and techniques to provide a minimum 2.0-mil dry film thickness that matches the color and texture of the shop paint.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.13 SHOP & FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections.

B. Bolted Connections: Bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Shop & field welds will be subject to tests and inspections.

1. Magnetic Particle Inspection: ASTM E 709.
2. Ultrasonic Inspection: ASTM E 164.
3. Perform test on 100% of all full penetration welds, 25% of all partial penetration and field fillet welds and 5% of all shop welds using magnetic particle method or ultrasonic method. The balance of all field welds will be visually inspected according to AWS D1.1. Engineer may reduce frequency of tests when test results are consistently within acceptable range.
4. Cracks or zones of incomplete fusion or penetration will not be accepted.

D. Testing agency will report test results promptly and in writing to Contractor and Architect.

E. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

END OF SECTION 055000

SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel railings.

B. Related Requirements:

1. Section 099600 High-Performance Coatings for steel tube railings associated with precast stairs

1.2 COORDINATION

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

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

1.3 ACTION SUBMITTALS

A. Product Data:
1. Fasteners.
2. Post-installed anchors.
3. Handrail brackets.
4. Shop primer.
5. Intermediate coats and topcoats.
6. Bituminous paint.
7. Nonshrink, nonmetallic grout.
8. Metal finishes.
9. Paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

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

D. Samples for Verification: For each type of exposed finish required.

1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters, including finish.
2. Fittings and brackets.
3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.

    a. Show method of connecting and finishing members at intersections.

E. Delegated Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For delegated design professional engineer.

B. Welding certificates.

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

D. Product Test Reports: For tests on railings performed by a qualified testing agency, in accordance with ASTM E894 and ASTM E935.

E. Research Reports: For post-installed anchors, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

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

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect mechanical finishes on exposed surfaces of railings from damage by applying a strippable, temporary protective covering before shipping.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

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

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ ft. applied in any direction.
b. Concentrated load of 200 lbf 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 applied horizontally on an area of 1 sq. ft..
b. Infill load and other loads need not be assumed to act concurrently.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 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: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

1. Provide type of bracket with predrilled hole for exposed bolt anchorage and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

2.3 STEEL RAILINGS

A. Source Limitations: Obtain each type of railing from single source from single manufacturer.

B. Tubing: ASTM A500/A500M (cold formed) or ASTM A513/A513M, Type 5.

C. Pipe: ASTM A53/A53M, Type F or Type S, Grade A, Extra Strong (Schedule 80), unless another grade and weight are required by structural loads or indicated on drawings.

1. Provide galvanized finish for exterior installations and where indicated.

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

E. Cast Iron Fittings: 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 zinc coating.
2. Hot-Dip Galvanized Railing Components: Type 304 stainless steel or hot-dip zinc-coated steel fasteners complying with ASTM A153/A153M or ASTM F2329/F2329M for zinc coating.
3. Aluminum Railing Components: Type 316 stainless steel fasteners.
4. Stainless Steel Railing Components: Type 316 stainless steel fasteners.
5. Finish exposed fasteners to match appearance, including color and texture, of railings.

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

C. Fasteners for Interconnecting Railing Components:

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
2. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.

D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193.

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. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 2 stainless steel bolts, ASTM F593, and nuts, ASTM F594.

2.5 MISCELLANEOUS MATERIALS

A. Handrail Brackets: Cast iron center of handrail location as indicated on drawings.

B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

C. Galvanizing Repair Paint: High-zinc-dust-content paint, complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

E. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

F. Intermediate Coats and Topcoats: Provide products that comply with Section 099600 "High-Performance Coatings."

G. Bituminous Paint: Cold-applied asphalt emulsion, complying with ASTM D1187/D1187M.

H. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout, complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 FABRICATION

A. General: 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. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.

1. Clearly mark units for reassembly and coordinated installation.
2. Use connections that maintain structural value of joined pieces.

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

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

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that are exposed to weather in a manner that excludes water.

1. Provide weep holes where water may accumulate.
2. Locate weep holes in inconspicuous locations.

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

G. Connections: Fabricate railings with welded connections unless otherwise indicated.

H. Gates: Form gates from steel tube of same size and shape as top rails, with infill to match guards. Provide with spring hinges for fastening to wall or guard system and overlapping stop with rubber bumper to prevent gate from opening in direction opposite egress.

I. 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. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.

3. Remove flux immediately.
4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #2 welds; good appearance, completely sanded joint, some undercutting and pinholes okay.

J. Form changes in direction as follows:

1. As detailed.
2. By bending to smallest radius that will not result in distortion of railing member.

K. 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.

L. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.

M. 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 or less.

N. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

O. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work.

1. Fabricate anchorage devices capable of withstanding loads imposed by railings.
2. Coordinate anchorage devices with supporting structure.

2.7 STEEL AND IRON FINISHES

A. Galvanized Railings:

1. Hot-dip galvanize steel railings, including hardware, after fabrication.
2. Comply with ASTM A123/A123M for hot-dip galvanized railings.
3. Comply with ASTM A153/A153M for hot-dip galvanized hardware.
4. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
5. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner and as follows.

1. Comply with SSPC-SP 16.

D. 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.

E. High-Performance Coating: Apply epoxy intermediate and polyurethane topcoats to prime-coated surfaces. Comply with coating manufacturer's written instructions and with requirements in SSPC-PA 1 for shop painting. Apply at spreading rates recommended by coating manufacturer.

1. Color: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

3.2 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 are 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.
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.

B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article, whether welding is performed in the shop or in the field.

3.4 ANCHORING POSTS

A. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Leave anchorage joint exposed with anchoring material flush with adjacent surface.

C. Anchor posts to metal surfaces with flanges, angle type, or floor type, as required by conditions, connected to posts and to metal supporting members as indicated on drawings.

3.5 ATTACHING RAILINGS

A. Attach handrails to walls with wall brackets. Provide brackets with clearance from inside face of handrail and finished wall surface as indicated on drawings.

1. Use type of bracket with predrilled hole for exposed bolt anchorage.
2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

B. Secure wall brackets 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.

C. Install railing gates level, plumb, and secure for full opening without interference.

1. Attach hardware using tamper-resistant or concealed means.
2. Adjust hardware for smooth operation.

3.6 REPAIR

A. 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.

    a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

3.7 CLEANING

A. Clean by washing thoroughly with clean water and soap and rinsing with clean water.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A780/A780M.

3.8 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

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

END OF SECTION 055213

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Framing with engineered wood products.
3. Wood blocking and nailers.

B. Related Requirements:
1. Section 061600 "Sheathing"
2. Section 061800 "Glued-Laminated Construction”

1.2 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.

C. Exposed Framing: Framing not concealed by other construction.

D. Lumber grading agencies, and abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NLGA: National Lumber Grades Authority.
3. SPIB: The Southern Pine Inspection Bureau.
4. WCLIB: West Coast Lumber Inspection Bureau.
5. WWPA: Western Wood Products Association.

1.3 ACTION SUBMITTALS

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

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.

3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

B. Fastener Patterns: Full-size templates for fasteners in exposed framing.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates:

1. For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Reports: For the following, from ICC-ES:
1. Power-driven fasteners.
2. Post-installed anchors.
3. Metal framing anchors.

1.5 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: Comply with DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.Factory mark each piece of lumber with grade stamp of grading agency.
1. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry wood products.
3. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber:

1. Boards: 19 percent.
2. Dimension Lumber: 19 percent

C. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable design stresses, as published by manufacturer, shall meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 DIMENSION LUMBER FRAMING

A. Joists, Rafters, and Other Framing by Grade: No. 1 and better

1. Species:
   a. Douglas fir-larch; WCLIB or WWPA.
   b. Douglas fir-larch (north); NLGA.

B. Exposed Framing to Receive a Stained or Natural Finish per Architect: Hand-select material for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knotholes, shake, splits, torn grain, and wane.

1. Species and Grade: Douglas fir-larch, No. 1 and better

2.3 MISCELLANEOUS LUMBER

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

1. Blocking.
2. Nailers.
3. Cants.
4. Furring.

B. Dimension Lumber Items: No. 2 grade lumber of the following species:
1. Northern species - hem-fir (north) and spruce-pine-fir; NLGA.

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

D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.4 FASTENERS

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

1. Where rough carpentry is exposed to weather, provide fasteners with hot-dip zinc coating complying with ASTM A153.

B. Nails, Brads, and Staples: ASTM F1667.

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

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

2.5 METAL FRAMING ANCHORS

A. Simpson Strong-Tie

B. Allowable design loads, as published by manufacturer, shall meet or exceed those of basis-of-design products. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.

C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653, G60 coating designation.

1. Use for interior locations unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

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

C. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

D. Do not splice structural members between supports unless otherwise indicated.

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

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

1. Table 2304.10.1, "Fastener Requirements” in the 2020 New York State Building Code.

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

H. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

1. Comply with approved fastener patterns where applicable.
2. Use common nails unless otherwise indicated. Drive nails snug but no countersunk heads.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILERS

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

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

3.3 INSTALLATION OF WOOD FURRING

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal-size furring horizontally at 24 inches o.c.

3.4 INSTALLATION OF CEILING JOIST AND RAFTER FRAMING

A. Rafters: Notch to fit exterior wall plates and use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.

B. Provide special framing as indicated for eaves, overhangs, and similar conditions if any.

END OF SECTION 061000

SECTION 061600 - SHEATHING

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. Wall sheathing
   2. Roof sheathing.

B. Related Requirements:

   1. Section 061000 "Rough Carpentry"
   2. Section 061800 "Glued-Laminated Construction”

1.3 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS

A. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

B. Factory mark panels to indicate compliance with applicable standard.

2.2 WALL SHEATHING

A. Plywood Sheathing: DOC PS 1 Exterior Structural, Grade 1.
   1. Nominal Thickness: Not less than 5/8 inch.

2.3 ROOF SHEATHING

A. Plywood Sheathing: DOC PS 1 Exterior Structural, Grade 1.

1. Nominal Thickness: Not less than 3/4 inch.

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153.

B. Nails, Brads, and Staples: ASTM F1667.

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

D. Screws for Fastening Sheathing to Wood Framing: ASTM C1002.

E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.10.1, "Fastener Requirements" in the 2020 New York State Building Code.

D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Wall and Roof Sheathing:

a. Nail to wood framing. Apply a continuous bead of glue to framing members at edges of wall sheathing panels.
b. Screw to cold-formed metal framing.
c. Space panels 1/8 inch apart at edges and ends.

END OF SECTION 061600

SECTION 061800 - GLUED-LAMINATED CONSTRUCTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural glued-laminated timber.
2. Timber connectors.
3. Factory finishing.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for dimension lumber items associated with structural glued-laminated timber.

1.2 DEFINITIONS

A. Structural Glued-Laminated (Glulam) Timber: An engineered, stress-rated timber product assembled from selected and prepared wood laminations bonded together with adhesives and with the grain of the laminations approximately parallel longitudinally.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include data on lumber, adhesives, fabrication, and protection.
2. For preservative-treated wood products. Include chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
3. For connectors. Include installation instructions.

B. Shop Drawings:

1. Show layout of structural glued-laminated timber system and full dimensions of each member.
2. Indicate species and laminating combination.

1.4 INFORMATIONAL SUBMITTALS

A. Certificates of Conformance: Issued by a qualified testing and inspecting agency indicating that structural glued-laminated timber complies with requirements in ANSI A190.1.

B. Material Certificates: For preservative-treated wood products, from manufacturer. Indicate type of preservative used and net amount of preservative retained.

C. Research/Evaluation Reports: For structural glued-laminated timber and timber connectors, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: An AITC- or APA-EWS-licensed firm

1.6 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with provisions in AITC 111.

B. Individually wrap members using plastic-coated paper covering with water-resistant seams.

PART 2 - PRODUCTS

2.1 STRUCTURAL GLUED-LAMINATED TIMBER

A. General: Provide structural glued-laminated timber that complies with ANSI A190.1 and ANSI 117 or research/evaluation reports acceptable to authorities having jurisdiction.

1. Factory mark each piece of structural glued-laminated timber with AITC Quality Mark or APA-EWS trademark. Place mark on surfaces that are not exposed in the completed Work.
2. Provide structural glued-laminated timber made from single species.
3. Provide structural glued-laminated timber made from solid lumber laminations; do not use laminated veneer lumber.
4. Provide structural glued-laminated timber made with wet-use adhesive complying with ANSI A190.1.

B. Species and Grades for Cantilevered Roof Beams:

1. Species and Beam Stress Classification: Douglas fir-larch, 24FV-1.8E
2. Lay-up: Balanced.

C. Species and Grades for Arched Beams:

1. Species and Beam Stress Classification: Douglas fir-larch, 24FV-1.8E
2. Lay-up: Either balanced or unbalanced.

D. Appearance Grade: Architectural, complying with AITC 110.

1. For Architectural appearance grades, fill voids as required by AITC 110.

2.2 TIMBER CONNECTORS

A. Simpson Strong-Tie Co., Inc., unless otherwise indicated.

B. Provide bolts, 3/4 inch diameter unless otherwise indicated, complying with ASTM A307, Grade A; nuts complying with ASTM A563; and, where indicated, flat washers.

C. Materials: Unless otherwise indicated, fabricate from the following materials:

1. Structural-steel shapes, plates, and flat bars complying with ASTM A36/A36M.

D. Hot-dip galvanize steel assemblies and fasteners after fabrication to comply with ASTM A123 or ASTM A153.

2.3 MISCELLANEOUS MATERIALS

A. End Sealer: Manufacturer's standard, transparent, colorless wood sealer that is effective in retarding the transmission of moisture at cross-grain cuts and is compatible with indicated finish.

B. Penetrating Sealer: Manufacturer's standard, transparent, penetrating wood sealer that is compatible with indicated finish.

2.4 FABRICATION

A. Shop fabricate for connections to greatest extent possible, including cutting to length and drilling bolt holes.

1. Dress exposed surfaces as needed to remove planing and surfacing marks.

B. Camber: Fabricate horizontal and inclined members of less than 1:1 slope with either circular or parabolic camber equal to 1/500 of span.

C. End-Cut Sealing: Immediately after end cutting each member to final length, apply a saturation coat of end sealer to ends and other cross-cut surfaces, keeping surfaces flood coated for not less than 10 minutes.

D. Seal Coat: After fabricating, sanding, and end-coat sealing, apply a heavy saturation coat of penetrating sealer on surfaces of each unit.

2.5 FACTORY FINISHING

A. Semitransparent Stain Finish: Manufacturer's standard oil-based stain, resistant to mold and fungus with top-quality stain-blocking primer.

1. Color: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates in areas to receive structural glued-laminated timber, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. General: Erect structural glued-laminated timber true and plumb and with uniform, close-fitting joints. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.

1. Handle and temporarily support glued-laminated timber to prevent surface damage, compression, and other effects that might interfere with indicated finish.

B. Cutting: Avoid extra cutting after fabrication. Where field fitting is unavoidable, comply with requirements for shop fabrication.

C. Install timber connectors as indicated.

1. Unless otherwise indicated, install bolts with same orientation within each connection and in similar connections.
2. Install bolts with orientation as indicated or, if not indicated, as directed by Architect.

3.3 ADJUSTING

A. Repair damaged surfaces and finishes after completing erection. Replace damaged structural glued-laminated timber if repairs are not approved by Architect.

3.4 PROTECTION

A. Do not remove wrappings on individually wrapped members until they no longer serve a useful purpose, including protection from weather, sunlight, soiling, and damage from work of other trades.

1. Coordinate wrapping removal with finishing work. Retain wrapping where it can serve as a painting shield.
2. Slit underside of wrapping to prevent accumulation of moisture inside the wrapping.

END OF SECTION 061800

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Polyisocyanurate foam-plastic board insulation.
2. Glass-fiber blanket insulation.

B. Related Requirements:

1. Section 042000 "Unit Masonry" for insulation installed in masonry cells.
2. Section 072119 "Foamed-in-Place Insulation" for spray-applied polyurethane foam insulation.
3. Section 075323 "Ethylene-Propylene-Diene-Monomer (EPDM) Roofing for insulation specified as part of roofing construction.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

INFORMATIONAL SUBMITTALS

B. Installer's Certification: Listing type, manufacturer, and R-value of insulation installed in each element of the building thermal envelope.

1. For blown-in or sprayed fiberglass and cellulosic-fiber loose-fill insulation, indicate initial installed thickness, settled thickness, settled R-value, installed density, coverage area, and number of bags installed.
2. Sign, date, and post the certification in a conspicuous location on Project site.

C. Product Test Reports: For each product, for tests performed by a qualified testing agency.

D. Research Reports: For foam-plastic insulation, from ICC-ES.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indexes less than Class A, 25 and 450 when tested in accordance with ASTM E84.

B. Fire-Resistance Ratings: Comply with ASTM E119 or UL 263; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from listings of another qualified testing agency.

C. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

D. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inchesand wider in width.

E. Thermal-Resistance Value (R-Value): R-value as indicated on Drawings in accordance with ASTM C518.

2.2 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Products: Subject to compliance with requirements, provide one of the products specified.
3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.3 POLYISOCYANURATE FOAM-POLYISOCYANURATE FOAM-PLASTIC BOARD INSULATION

A. Polyisocyanurate Board Insulation, Glass-Fiber-Mat Faced: ASTM C1289, glass-fiber-mat faced, Type II, Class 2.

1. DiversiFoam Products
2. Dow Chemical Company
3. Owens Corning

2.4 GLASS-FIBER BLANKET INSULATION

A. Available Manufacturers:

1. CertainTeed Corporation.
2. Guardian Fiberglass, Inc.
3. Johns Manville.
4. Knauf Fiber Glass.
5. Owens Corning.

B. Glass-Fiber Blanket Insulation, Reinforced-Foil Faced: ASTM C665, Type III (reflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.

2.5 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.

1. Available Products:
   a. AGM Industries, Inc.; Series T TACTOO Insul-Hangers.
   b. Eckel Industries of Canada; Stic-Klip Type N Fasteners.
   c. Gemco; Spindle Type
2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inchthick by 2 inchessquare.
3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inchin diameter; length to suit depth of insulation.

B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inchessquare or in diameter.

1. Available Products:

   a. AGM Industries, Inc.; RC150.
   b. AGM Industries, Inc.; SC150.
   c. Gemco; Dome-Cap.

d. Gemco; R-150.
e. Gemco; S-150.

C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.

1. Available Products:

a. AGM Industries, Inc.; TACTOO Adhesive.
b. Eckel Industries of Canada; Stic-Klip Type S Adhesive.
c. Gemco; Tuff Bond Hanger Adhesive.

D. Insulation Fastener Accessories: Provide double-pointed weld pins, lagging pins, quilting pins, duct liner pins, insulation hangers, specialty washers, special caps, j-hooks, capacitor discharge annular weld pins, capacitor discharge acoustical lagging pins, and other accessory materials that are recommended in writing by insulation fastener manufacturer to produce complete insulation supports.

2.6 ACCESSORIES

A. 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.

B. Miscellaneous Application Accessories:

1. 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.
2. Crack Sealer: Closed-cell insulating foam in aerosol dispenser recommended in writing by insulation manufacturer for filling gaps in board insulation.
3. Curtain-Wall Insulation Clips: Z-shaped galvanized steel as recommended in writing by insulation manufacturer.
4. Detailing Foam Insulation for Voids: Urethane foam complying with AAMA 812, low expansion pressure suitable for filling insulation gaps and voids adjacent to openings to protect against water, air, and sound intrusion.
5. Tapes for Reflective Insulation and Barriers:

a. Aluminum-foil tape for repairs or splicing material.
b. Double-sided tape for adhering to metal framing or overlapping material.
c. Reinforced-foil tape for sealing tears or cuts in sheet vapor barrier.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.

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

3.2 PREPARATION

A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or those that interfere with insulation attachment.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products, applications and applicable codes.

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.

F. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

G. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF SLAB INSULATION

A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive in accordance with manufacturer's written instructions.

1. If not otherwise indicated, extend insulation a minimum of 24 inchesbelow exterior grade line.

B. On horizontal surfaces, loosely la insulation units in accordance with manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

1. If not otherwise indicated, extend insulation a minimum of 24 inchesfrom exterior walls.

3.5 INSTALLATION OF FOUNDATION WALL INSULATION

A. Butt panels together for tight fit.

B. Anchor Installation: Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:

1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive in accordance with anchor manufacturer's written instructions.
2. Space anchors in accordance with insulation manufacturer's written instructions for insulation type, thickness, and application.
3. Apply insulation standoffs to each spindle to create cavity width indicated on Drawings between concrete substrate and insulation.
4. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation.
5. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

3.6 INSTALLATION OF CAVITY-WALL INSULATION

A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 incheso.c. both ways on inside face and as recommended in writing by manufacturer.

1. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions, and with faces flush.
2. Press units firmly against inside substrates.
3. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Section 042000 "Unit Masonry."

B. Mineral-Wool Board Insulation: Install insulation fasteners 4 inchesfrom each corner of board insulation, at center of board, and as recommended by manufacturer.

1. Fit courses of insulation between masonry wall ties and other obstructions, with edges butted tightly in both directions, and with faces flush.
2. Press units firmly against inside substrates.

3.7 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

A. Blanket Insulation: Install in cavities formed by framing members in accordance with the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inchclearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

5. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.

    a. Exterior Walls: Set units with facing placed toward exterior of construction or as indicated on Drawings.

B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft..
2. Detailing Foam Insulation for Voids: Apply in accordance with manufacturer's written instructions.

3.8 INSTALLATION OF BOARD INSULATION

A. Install board insulation in accordance with manufacturer's written instructions per project applications and conditions.

B. Installation of board insulation in curtain-wall construction

1. Retain insulation in place by metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated between insulation and glass.

2. Install insulation where it contacts perimeter fire-containment system to prevent insulation from bowing under pressure from perimeter fire-containment system.

3.9 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

B. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 072119 - FOAMED-IN-PLACE INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Closed-cell spray polyurethane foam insulation.
2. Fire Protective Intumescent Coating.

B. Related Requirements:

1. Section 072100 "Thermal Insulation" for foam-plastic board insulation.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Closed-cell spray polyurethane foam insulation.
2. Fire Protective Intumescent Coating

1.3 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, for tests performed by qualified testing agency.

B. Research Reports: For spray-applied polyurethane foam-plastic insulation, from an agency acceptable to authorities having jurisdiction showing compliance with all applicable codes.

C. Field quality-control reports.

D. Qualification Statements: For Installer.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 CLOSED-CELL SPRAY POLYURETHANE FOAM INSULATION

A. Closed-Cell Spray Polyurethane Foam: ASTM C1029, Type II, minimum density of 2.0 lb/cu. Ft. and minimum aged R-value at 1-inch thickness of 7.4 deg F x h x sq. ft./Btu at 75 deg F.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Heatlok HFO Pro, by Huntsmany Building Solutions (Basis Of Design).
    b. JM Corbond IV by John Manville.
    c. Insulstar by NCFI Polyurethanes.
    d. Or Approved Equal.

2. 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: 20 or less.
    b. Smoke-Developed Index: 400 or less.

3. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

4. Additional Product Requirements
    a. Comply with local Building Code requirements
    b. Material to have been tested in accordance with ASTM E 1042. Testing laboratory must be NVLAP accredited.
    c. Bond strength shall be greater than 100 psf per ASTM E 736. Provide primer material recommended by insulation manufacturer where required for adhesion of insulation to substrates.
    d. Product shall be Class 1 Class A per ASTM E 84 / UL 723.
    e. Non-corrosive per ASTM C 739.
    f. Bond deflection per ASTM E 759: 6" Deflection in 10’ Span – no spalling or delamination.
    g. R-Value to be 7 per inch per ASTM C 518.
    h. Comply with IBC Section 803stability requirements for interior finishes.
    i. Meet ASTM C 1149.
    j. Manufacturer’s written certification that product contains no asbestos, fiberglass or other man-make mineral fibers.
    k. Cannot contain added Urea-Formaldehyde Resins.

2.2 FIRE PROTECTIVE INTUMESCENT COATING

A. Mastic and Intumescent Fire-Resistive Coating (Thermal and Ignition Barrier): UL-723 Manufacturer’s standard, factory-mixed formulation or factory-mixed, multicomponent system consisting of intumescent base coat and topcoat...

1. Manufacturers: Spray-applied closed-cell insulation and fire-resistive coating shall be tested for fire-resistance as a single system. Subject to compliance with requirements, and system compatibility with approved spray-applied closed-cell insulation product, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Blaselok TBX Intumescent Coating, by Huntsman Building Solutions. (Basis Of Design).

b. F10E by Fireshell.
c. CD315 by International Fire Technology.
d. Plus ThB by No Burn.
e. Or Approved Equal.

2. Application: Designated for “conditioned interior space purpose” use by a qualified testing agency acceptable to authorities having jurisdiction.
3. Thickness: As required for fire-resistance design indicated, measured in accordance with requirements of fire-resistance design.
4. Performance: Fire-protective intumescent coating shall be formulated for application over polyurethane foam plastics, compatible with insulation, and shall provide a 15-minute minimum fire-ignition barrier, and is intended to prevent flame-source access to foam and delay temperature-rise of foam during a fire event.
5. Testing: Fire-protective intumescent coating shall pass testing as part of an approved assembly, in accordance with and complying with acceptance criteria of both the Temperature Transmission Fire Test and the Intregrity Fire Test of NFPA 275, and in compliance with ICC-ES AC377, Appendix X..

6. Topcoat: 8- to 12-mil- thick, heavy-duty protective coating recommended in writing by intumescent thermal barrier manufacturer as compatible with substrate materials.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify that substrates are clean, dry, and free of substances that are harmful to insulation.

B. Priming: Prime substrates where recommended by insulation manufacturer. Apply primer to comply with insulation manufacturer's written instructions. Confine primers to areas to be insulated; do not allow spillage or migration onto adjoining surfaces.

3.2 INSTALLATION

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Spray insulation to envelop entire area to be insulated and fill voids.

C. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer. Do not spray into rising foam.

D. Framed Construction: Install into cavities formed by framing members to achieve thickness indicated on Drawings.

E. Miscellaneous Voids: Apply according to manufacturer's written instructions.

F. Install thermal and ignition barrier material.

1. Do not cover insulation prior to any required spray foam insulation inspections.

G. Apply barrier coatings in accordance with manufacturer's written instructions and to comply with requirements for listing and labeling for fire-propagation characteristics and surface-burning characteristics specified.

1. Use equipment and techniques best suited for substrate and type of material applied as recommended by coating manufacturer.
2. Apply coatings to prepared surfaces as soon as practical after preparation and before subsequent surface soiling or deterioration.
3. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Produce sharp lines and color breaks.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect spray foam insulation installation, including accessories. Report results in writing.

3.4 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

END OF SECTION 072119

SECTION 074113.16 - STANDING-SEAM METAL ROOF PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Standing-seam metal roof panels.

B. Related Sections:

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of roof accessories and roof-mounted equipment.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review structural loading limitations of deck purlins and rafters during and after roofing.
6. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal panels.
7. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
8. Review temporary protection requirements for metal panel systems during and after installation.
9. Review procedures for repair of metal panels damaged after installation.
10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Manufacturer’s Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.
3. Indicate work to be field fabricated or field assembled.

C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Metal Panels: 12 inches long by actual panel width. Include clips, fasteners, closures, and other metal panel accessories.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company with not less than 10 years of documented experience.

1. Certified ISO 9001:2015 with Design.

B. Installer Qualifications: Company with at least three years of documented experience.

1. MCA Roof Installation Certificate of Completion.

C. Source Limitations: Obtain all components for roofing system from or approved by roofing system manufacturer.

D. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
1. Build mockups for typical roof area only, including accessories.

a. Size: 12 ft. long by 6 ft..
b. Each type of exposed seam and seam termination.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels on Project site as recommended by manufacturer to minimize damage, ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels and trims during installation for removal immediately after installation.

E. Copper Panels: Wear gloves when handling to prevent fingerprints and soiling of surface.

1.8 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed in accordance with manufacturers' written instructions and warranty requirements.

1.9 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

A. Product Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Structural failures including rupturing, cracking, or puncturing.
    b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Ten years from date of Substantial Completion.

B. Finish Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

    a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
    b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
    c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 30 years from date of Substantial Completion.

C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

1. Single-source warranty protection.
2. All trims, accessories, and underlayments included.
3. Full coverage for materials and labor associated with roof installation.
4. Periodic evaluations and final roof evaluation written report by manufacturer-authorized third-party roof inspector.
5. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Solar Reflectance Index (SRI): Not less than 78 when calculated in accordance with ASTM E1980, based on testing identical products by a qualified testing agency.

B. Solar Reflectance Index (SRI): Three-year-aged SRI not less than 64 when calculated in accordance with ASTM E1980, based on testing identical products by a qualified testing agency.

C. "Solar Reflectance Index (SRI)" Paragraph below applies to Green Globes. First option is minimum for roofs with slopes of 2:12 or less; second option is for roofs with slopes steeper than 2:12.Solar Reflectance Index (SRI): Not less than 78 when calculated in accordance with ASTM E1980, based on testing identical products by a qualified testing agency.

D. Energy Performance: Provide roof panels in accordance with one of the following when tested in accordance with CRRC-1:

1. Three-year, aged solar reflectance of not less than 0.55 and emissivity of not less than 0.75.

E. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing in accordance with ASTM E1592:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.
3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

4. Test-Pressure Difference: 1.57 lbf/sq. ft..

F. Water Penetration under Static Pressure: No water penetration when tested in accordance with ASTM E1646 at the following test-pressure difference:

1. Test-Pressure Difference: 2.86 lbf/sq. ft..

G. Comply with ANSI/MCA FTS-1-2019, "Test Method for Wind Load Resistance of Flashings Used with Metal Roof Systems."

H. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.

1. Uplift Rating UL 580 and UL 30 verify the designation as Class vs. UL or with supplemental testing of UL 1897 to failure beyond UL 580 Class 90 designation.

I. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations 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.

2.2 STANDING-SEAM METAL ROOF PANELS

A. Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.

1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1514.
2. Aluminum Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1637.

B. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels AB1.2: Formed with vertical ribs at panel edges and a flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and mechanically seaming panels together.

1. Basis-of-Design Product: Subject to compliance with requirements, provide ATAS International, Inc.; Field-Lok FLL or comparable product by one of the following:

    a. CENTRIA Architectural Systems.
    b. IMETCO.

2. Aluminum Sheet: Coil-coated sheet, ASTM B209, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.

    a. Thickness: 0.040 inch.
    b. Surface: Smooth, flat finish.
    c. Exterior Finish: Mica fluoropolymer.
    d. Color: As selected by Architect from manufacturer's full range.

3. Clips: One-piece fixed to accommodate thermal movement.
    a. Material: 0.0250-inch- thick, stainless steel sheet.

4. Joint Type: As standard with manufacturer.
5. Panel Coverage:

    a. FLL:

        1) Seam Height: 1 inch.

2.3 UNDERLAYMENT MATERIALS

A. Mechanically Fastened Roofing Underlayment: Provide mechanically fastened roofing underlayment without sealed seams; woven polypropylene with anti-slip polyolefin coating on both sides, minimum thickness 30 mils (.76 mm); meeting or exceeding requirements of ASTM D226/D226M.

1. Basis-of-Design Product: Subject to compliance with requirements, provide ATAS International, Inc.; ATA-Guard Underlayment or comparable product by one of the following:

    a. GCP Applied Technologies, Inc., Tri-Flex XT Synthetic Underlayment.
    b. Owens Corning, Titanium UDL50.

2.4 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C645; cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 hot-dip galvanized coating designation or ASTM A792/A792M, Class AZ50 coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide factory-formed components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels. Provide prefabricated, pre-notched, close-fitting components of aluminum in the same color and finish as the roofing panel.
2. Above Sheathing Ventilation (ASV) Spacer Shims: Polyoxymethylene (engineered thermoplastic) 3/8 inch stackable shims.
3. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
4. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide factory-formed flashing and trim formed from same material as metal panels, 144 inches minimum, as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Gutters: Formed from aluminum, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 144-inch long sections, of size and metal thickness in accordance with SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced a maximum of 36 inches o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match metal roof panels.

E. Downspouts: Formed from aluminum of the same color and finish as roof panels. Fabricate in 144-inch long sections, complete with formed elbows and offsets, of size and metal thickness in accordance with SMACNA's "Architectural Sheet Metal Manual." Finish downspouts to match gutters.

F. Roof Curbs: Fabricated from same material as roof panels, 0.048-inch nominal thickness; with bottom of skirt profiled to match roof panel profiles and with welded top box and integral full-length cricket. Fabricate curb subframing of 0.060-inch-nominal thickness, angle-, C-, or Z-shaped steel sheet. Fabricate curb and subframing to withstand indicated loads of size and height indicated. Finish roof curbs to match metal roof panels.

1. Insulate roof curb with 1-inch-thick, rigid insulation.

G. Panel Fasteners:

1. Fasteners: Manufacturer's standard type.

a. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws.
b. Metal-to-Wood Fasteners: Self-tapping wood screws.
c. Carbon steel thread with organic long-life coating.
d. Exposed Fasteners: Type 304 stainless steel cap head.

2. Encapsulated EPDM Washer: Baked-on, high-performance-compatible, chip-resistant finish to match panel color.

H. Panel Sealants: Provide sealant types recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Exposed Sealant: High-performance elastomeric, clear tri-polymer sealant, as recommended by manufacturer.
2. Spacer Cubes: High-performance spacer cubes to prevent bottoming out of sealant when fasteners are installed non-curing butyl tape.
3. Seam Sealant: Factory-applied high-performance, high-solid, non-skinning, non-drying seam sealant formulated for roll-forming application into concealed panel joints.

2.5 FABRICATION

A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. Sheet Metal Flashing and Trim: Factory-fabricate flashing and trim to comply with manufacturer's written instructions and ANSI/MCA FTS-1-2019, "Test Method for Wind Load Resistance of Flashings Used with Metal Roof Systems" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

D. No exposed cut edges on seams or panels.

2.6 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Wet Chemistry Cleaning and Pretreatment:

1. Use complex chrome-oxide pretreatment.
2. Use chrome final rinse.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Aluminum Panels and Accessories:
   1. Mica Fluoropolymer: AAMA 2605. Two-coat fluoropolymer finish with suspended mica flakes containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

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

   1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.
   2. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.

      a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

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

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages in accordance with ASTM C754 and metal panel manufacturer's written recommendations.

3.3 INSTALLATION OF UNDERLAYMENT

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below and or as indicated on Drawings, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Extend underlayment into gutter trough. Roll laps with roller. Cover underlayment within 14 days.

1. Apply over the entire roof surface.
2. Apply over the roof area indicated below:

    a. Roof perimeter for a distance up from eaves of 24 inches beyond interior wall line.
    b. Valleys, from lowest point to highest point, for a distance on each side of 18 inches. Overlap ends of sheets not less than 6 inches.
    c. Rake edges for a distance of 18 inches.
    d. Hips and ridges for a distance on each side of 12 inches.
    e. Roof-to-wall intersections for a distance from wall of 18 inches.
    f. Around dormers, chimneys, skylights, and other penetrating elements for a distance from element of 18 inches.

3.4 INSTALLATION OF STANDING-SEAM METAL ROOF PANELS

A. Install metal panels in accordance with manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes.
4. Remove protective film from surface of roof panels and trims immediately prior to installation.
5. Locate and space fastenings in uniform vertical and horizontal alignment.
6. Install flashing and trim as metal panel work proceeds.
7. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
8. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
9. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Steel Panels: Use stainless steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
2. Aluminum Panels: Use aluminum or stainless steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
3. Copper Panels: Use copper, stainless steel, or hardware-bronze fasteners.
4. Stainless Steel Panels: Use stainless steel fasteners.

C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners in accordance with manufacturers' written instructions.

D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

E. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.

1. Install clips to supports with self-tapping fasteners.
2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions. Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 12 ft. with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

H. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 36 inches o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

I. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.

1. Provide elbows at base of downspouts to direct water away from building.

J. Roof Curbs: Install flashing around bases where they meet metal roof panels.

K. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.5 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal panel units within installed tolerance of 1/4 inch in 20 ft. on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing.

B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.

C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

D. Prepare test and inspection reports.

3.7 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074113.16

SECTION 074213.19 - INSULATED METAL WALL PANELS

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. Foamed-insulation-core metal wall panels.
2. Laminated-fire-resistant metal wall panels.

B. Related Requirements:

1. Section 074293 "Soffit Panels" for metal panels used in horizontal soffit applications.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of doors, windows, and louvers.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal panels.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for metal panel assembly during and after installation.
8. Review procedures for repair of metal panels damaged after installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include elevations, fastening patterns, and sections of each condition.
2. Include material type, metal thickness, paint finish, and manufacturer's installation suggestions.

C. Panel Samples: Submit 12 inch by full width sample panel indicating the metal, texture, and finish proposed.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

E. Buy American Certification: Submit documentation certifying that products comply with provisions of the Buy American Act 41 U.S.C 10a-10d.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Installed by a contractor with a minimum of five years' experience with this type of construction, and documentation indicating successful completion of contracts for projects of similar size, scope and materials.

B. Manufacturer Qualifications: Manufacturer's production and quality processes are inspected on a quarterly basis by third party quality control auditing programs through Factory Mutual, Underwriter Laboratories, and Intertek Testing Services. Quality control manuals for each accreditation agency are in place detailing the production and quality processes and methods used in the manufacturing of product.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect products of metal panel system during shipping, handling, and storage to prevent staining, denting, deterioration of components, or other damage.

B. Deliver, unload, store, and erect metal panels and accessory items in a manner to prevent bending, warping, twisting, and surface damage.

C. Store panels in accordance with manufacturer's written instructions.

D. Shield foam-insulated metal wall panels from direct sunlight until installation.

E. Store products off the ground, with panels sloped for drainage and covered to protect factory finishes from damage. Stack bundles no more than two high.

1.8 WARRANTY

A. Warranty: Manufacturer's written limited warranty providing panels to be free from defects in materials and workmanship, excluding coil coatings (paint finishes) that are covered under separate warranty.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Two-Coat Fluoropolymer, Non-Metallic, Exterior Paint Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Warranty Period for Adhesion to Metal Substrate: 40 years from date of Substantial Completion.
2. Warranty Period for Chalk and Fade: 30 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 72:

1. Wind Loads: Verified using a 20 psf simulated wind load.
2. Deflection Limits: For wind loads, no greater than 1/180 for exterior wall panels and 1/120 for partition and liner walls.
3. Large Missile Impact Test: Conducted in accordance with ASTM E 1886 and ASTM E 1996.
4. FM Approval Standard 4880, Standard for Class 1 Exterior Wall Systems. Wind pressures are calculated per FM Global Property Loss Prevention Data Sheet1-28, ratings are established and support spacing is determined based on FM Approval Standard 4880 listings.

B. Air Infiltration: Air leakage of not more than Air infiltration shall not exceed 0.01 cfm/ft. 2 at 20 psf , and 0.04 cfm/ sq. ft. of wall area when tested according to ASTM E 283 at a static pressure of 20 psf:

C. Static Water Penetration: There shall be no uncontrolled water penetration through the panel joints at a static pressure of 20 psf when tested in accordance with ASTM E 331.

D. Dynamic Water Penetration: There shall be no uncontrolled water penetration through the panel joints when subjected to a 95 mph slip stream air flow and application of water for a 15 minute period in accordance with AAMA501.1.

E. Condensation Resistance Factor: The minimum condensation resistance factor of the panel shall be 92 when tested in general accordance with AAMA 1503.1.

F. Thermal Performance: Panels shall provide a K-factor of 0.112 btu.sf/hr/deg F at a 35 deg F mean temperature when tested in accordance with ASTM C 518.

G. Fire-Test-Response Characteristics:

1. Surface Burning Characteristics: The insulated core shall have been tested in accordance with ASTM E 84 for surface burning characteristics. The core shall have a maximum flame spread of max 25 and a smoke developed rating max of 450.

2. Fire Propagation: The fire assembly shall meet the requirements of the standard for NFPA 285-19 and NFPA 286. Heat potential shall be determined using NFPA 259 Test Method for Potential Heat of Building Materials.
3. IBC Chapter 26: Panel performance under the above test methods, shall meet the requirements of IBC, Chapter on foam plastics.

2.2 FOAMED-INSULATION-CORE METAL WALL PANELS

A. General: Provide factory-formed and -assembled metal wall panels fabricated from two roll-formed metal facing sheets chemically bonded to insulation core foamed in place during fabrication, and with joints between panels designed to form weathertight seals. Include accessories required for weathertight installation.

1. Panel Performance:

a. Freeze/Heat Cycling: No delamination, surface blistering, or permanent bowing when subjected to cyclic temperature extremes of -20 deg F to +180 deg F for 21 eight hour cycles.
b. Humid Aging: Volume increase not greater than 6.0 percent and no delamination or metal corrosion when tested for seven days at 140 deg F and 100 percent relative humidity according to ASTM D 2126.
c. Fatigue: No evidence of delamination, core cracking, or permanent bowing when tested to a 20-lbf/sq. ft. positive and negative wind load and with deflection of L/180 for 2 million cycles.
d. Autoclave: No delamination when exposed to 2-psi pressure at a temperature of 212 deg F for 2-1/2 hours.

2. Insulation Core: Polyurethane foam using a non-CFC blowing agent, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively.

a. Closed-Cell Content: 92 percent when tested according to ASTM D 6226.
b. Density: 2.0 to 2.6 lb/cu. ft. when tested according to ASTM D 1622.
c. Compressive Strength: Minimum 20 psi when tested according to ASTM D 1621.
d. Shear Strength: 26 psi when tested according to ASTM C 273/C 273M.

B. Concealed-Fastener, Foamed-Insulation-Core Metal Wall Panels Refer to sheets AB5.2, AB8.2, and AB8.3: Formed with tongue-and-groove panel edges; designed for sequential installation by interlocking panel edges and mechanically attaching panels to supports using concealed clips or fasteners.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Metl-Span; 7.2 Insul-Rib Insulated Metal Wall Panel or a comparable product by one of the following:

   a. CENTRIA Architectural Systems.
   b. Firestone Building Products.

   c. 7.2 Insul-Rib™ Wall Panel, 36 in module width, with face with 7.2 in 1 1/2 in deep, with a Mesa profiled liner.

      1) Nominal Thickness: 3 in.

2. Thermal-Resistance Value (R-Value): 15.2 according to ASTM C 1363.
3. Materials:

   a. Exterior Face: G-90 galvanized steel conforming to ASTM A 653 and/or prefinished AZ50 aluminum-zinc coated steel conforming to ASTM A 792, minimum grade 33 with stucco embossed texture.

      1) Thickness: 24 Ga.

   b. Interior Liner: G-90 galvanized steel conforming to ASTM A 653 and/or AZ50 aluminum-zinc coated steel conforming to ASTM A 792, minimum grade 33, with stucco embossed texture.

      1) Thickness: 26 Ga.

   c. Foam Core: Continuously foamed-in-place, zero ODP and zero VOC closed cell polyurethane.
   d. Flashing and Trim:

      1) Provide complete insulated metal wall panel assembly incorporating trim and miscellaneous flashings. Provide required fasteners, clips, closures, tapes, and sealants.
      2) Flashing and trim shall be brake-formed sheet metal in the same thickness and finish to match panels.

4. Finishes:

   a. Exterior face sheet:

      1) Base Primer: Nominal 0.2 mil.
      2) Finish Coat: Nominal 0.7 mil full strength 70 percent PVDF Fluoropolymer coating in manufacturer's standard colors.

   b. Interior Sheet:

1) Primer: Nominal0.2 mil primer.
2) Finish Coat: Nominal 0.7 mil polyester coating in USDA compliant Igloo White.

5. Side Connections:

a. 7.2 Insul-Rib™ wall panels shall have offset double tongue and groove joinery with an extended metal shelf allowing fasteners to penetrate both metal faces with clips concealed in the side joint.

6. Sealants:

a. All sealants shall be field applied to ensure vapor and water tightness.

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90hot-dip galvanized coating designation or ASTM A 792/A 792M, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.4 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

B. Steel Panels and Accessories:
1. Mica Fluoropolymer: AAMA 621. Two-coat fluoropolymer finish with suspended mica flakes containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine all structural steel before beginning installation to insure that all supporting members are straight, level, plumb and satisfactory for panel installation.

B. Intermediate framing member (secondary structural supports) alignment tolerances required, as specified below:
   1. 0 to 1/8 inch outward of the actual wall framing plane for members at 5 ft. to 10 ft. m spacing.

C. Do not begin installation until unsatisfactory conditions are corrected.

D. Beginning of installation shall signify the structure and adjacent conditions as being proper and acceptable.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.3 INSULATED METAL WALL PANEL INSTALLATION

A. General: Apply continuous ribbon of sealant to panel joint on concealed side of insulated metal wall panels as vapor seal; apply sealant to panel joint on exposed side of panels for weather seal.

   1. Fasten foamed-insulation-core metal wall panels to supports with fasteners at each lapped joint at location and spacing and with fasteners recommended by manufacturer.
   2. Apply panels and associated items true to line for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
   3. Provide metal-backed washers under heads of exposed fasteners on weather side of insulated metal wall panels.
   4. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
   5. Provide sealant tape at lapped joints of insulated metal wall panels and between panels and protruding equipment, vents, and accessories.
   6. Apply a continuous ribbon of sealant tape to panel side laps and elsewhere as needed to make panels weathertight.
   7. Apply snap-on battens to exposed-fastener, insulated-core metal wall panel seams to conceal fasteners.

B. Foamed-Insulation-Core Metal Wall Panels: Fasten metal wall panels to supports with concealed clips at each joint at location and spacing and with fasteners recommended by manufacturer. Fully engage tongue and groove of adjacent panels.

1. Install clips to supports with self-tapping fasteners.

C. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

D. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to achieve waterproof performance.
2. 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 expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.4 FIELD QUALITY CONTROL

A. Panel installer shall inspect and approve each completed wall area and shall be responsible for protection of completed work from damage by other trades.

3.5 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films before exposure to sunlight.

B. Wipe finished surfaces clean of any filings caused by drilling or cutting to prevent rust staining.

C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074213.19

SECTION 075323 - ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ethylene-propylene-diene-terpolymer (EPDM) roofing.
2. Accessory roofing materials.
3. Vapor retarder.
4. Roof insulation.
5. Insulation accessories and cover board.
6. Walkways.

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry for wood nailers, curbs, and blocking.
2. Section 076200 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.
3. Section 077100 "Roof Specialties" for manufactured copings and roof edge flashings.
4. Section 079200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
5. Section 221423 "Storm Drainage Piping Specialties" for roof drains.

1.2 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D1079 and glossary of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to work of this Section.

1.3 PREINSTALLATION MEETINGS

1.4 ACTION SUBMITTALS

A. Product Data:

1. Ethylene-propylene-diene-terpolymer (EPDM) roofing.
2. Accessory roofing materials.
3. Vapor retarder.
4. Roof insulation.
5. Insulation accessories and cover board.
6. Walkways.

B. Product Data Submittals:

1. For insulation and roof system component fasteners, include copy of FM Approvals' RoofNav listing.

C. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:

1. Layout and thickness of insulation.
2. Base flashings and membrane terminations.
3. Flashing details at penetrations.
4. Tapered insulation, thickness, and slopes.
5. Roof plan showing orientation of steel roof deck and orientation of roof membrane and fastening spacings and patterns for mechanically fastened roofing system.
6. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

D. Samples for Verification: For the following products:

1. Roof membrane and flashings of color required.
2. Walkway pads or rolls, of color required.

E. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Manufacturer Certificates:

1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

a. Submit evidence of complying with performance requirements.

2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.

C. Product Test Reports: For components of roof membrane and insulation, for tests performed by a qualified testing agency, indicating compliance with specified requirements.

D. Evaluation Reports: For components of roofing system, from ICC-ES.

1. Field Test Reports:
2. Concrete internal relative humidity test reports.

E. Field quality-control reports.

F. Sample Warranties: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

B. Certified statement from existing roof membrane manufacturer stating that existing roof warranty has not been affected by Work performed under this Section.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is listed in FM Approvals' RoofNav for roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed in accordance with manufacturer's written instructions and warranty requirements.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.

1. Special warranty includes roof membrane, base flashings, roof insulation, fasteners, cover boards,walkways and other components of roofing system.
2. Warranty Period: 20 years from Date of Substantial Completion.
3. Limit of Liability: No dollar limitation (NDL).

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing system and base flashings to withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and flashings to remain watertight.

1. Accelerated Weathering: Roof membrane to withstand 2000 hours of exposure when tested in accordance with ASTM G152, ASTM G154, or ASTM G155.
2. Impact Resistance: Roof membrane to resist impact damage when tested in accordance with ASTM D3746, ASTM D4272, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.

B. Material Compatibility: Roofing materials to be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.

C. FM Approvals' RoofNav Listing: Roof membrane, base flashings, and component materials comply with requirements in FM Approvals 4450 or FM Approvals 4470 as part of a roofing system, and are listed in FM Approvals' RoofNav for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals Certification markings.

1. Fire/Windstorm Classification: Class 1A-60.
2. Hail-Resistance Rating: FM Global Property Loss Prevention Data Sheet 1-34 SH.

D. SPRI's Directory of Roof Assemblies Listing: Roof membrane, base flashings, and component materials comply with requirements in FM Approvals 4450 or FM Approvals 4470 as part of a roofing system, and are listed in SPRI's Directory of Roof Assemblies for roof assembly identical for that specified for this Project.

1. Wind Uplift Load Capacity: 60 psf.

E. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

2.2 ETHYLENE-PROPYLENE-DIENE-TERPOLYMER (EPDM) ROOFING

A. EPDM Sheet: ASTM D4637/D4637M, Type I, nonreinforced, self-adhering EPDM sheet with factory-applied seam tape.

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

a. Carlisle Syntec Systems.
b. Elevate; Holcim Building Envelope.
c. Johns Manville; a Berkshire Hathaway company.
d. Versico Roofing Systems; Carlisle Construction Materials.

e. Or Approved Equal.

2. Thickness: 60 mils, nominal.
3. Exposed Face Color: White on black.
4. Source Limitations: Obtain components for roofing system from roof membrane manufacturer] or manufacturers approved by roof membrane manufacturer.

2.3 ACCESSORY ROOFING MATERIALS

A. General: Accessory materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.

1. Adhesive and Sealants: Comply with VOC limits of authorities having jurisdiction.

B. Sheet Flashing: 60-mil- thick EPDM, partially cured or cured, according to application.

C. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.

D. Roof Vents: As recommended by roof membrane manufacturer.

1. Size: Not less than 4-inch diameter.

E. Bonding Adhesive: Manufacturer's standard.

F. Seaming Material: Factory-applied seam tape, width as recommended by manufacturer.

G. Lap Sealant: Manufacturer's standard, single-component sealant, colored to match membrane roofing.

H. Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.

I. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.

J. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening components to substrate, and acceptable to roofing system manufacturer.

K. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, molded pipe boot flashings, preformed inside and outside corner sheet flashings, reinforced EPDM securement strips, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.

1. Provide white flashing accessories for white EPDM membrane roofing.

2.4 VAPOR RETARDER

A. Rubberized-Asphalt-Sheet Vapor Retarder, Self-Adhering: ASTM D1970/D1970M, polyethylene film laminated to layer of rubberized asphalt adhesive, minimum 40-mil total thickness; maximum permeance rating of 0.1 perm; cold applied, with slip-resisting surface and release paper backing. Provide primer when recommended by vapor retarder manufacturer.

2.5 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by EPDM roof membrane manufacturer, approved for use in FM Approvals' RoofNav-listed roof assemblies.

B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1 glass-reinforced facer on both major surfaces.

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

   a. Carlisle Syntec Systems.
   b. Elevate; Holcim Building Envelope.
   c. Johns Manville; a Berkshire Hathaway company.
   d. Versico Roofing Systems; Carlisle Construction Materials.
   e. Or Approved Equal.
2. Compressive Strength: 20 psi.
3. Size: 48 by 48 inches.
4. Thickness:

   a. Base Layer: 1-1/2 inches.

C. Tapered Insulation: Provide factory-tapered insulation boards.

1. Material: Match roof insulation.
2. Minimum Thickness: 1/4 inch.
3. Slope:

   a. Roof Field: 1/4 inch per foot unless otherwise indicated on Drawings.
   b. Saddles and Crickets: 1/2 inch per foot unless otherwise indicated on Drawings.

2.6 INSULATION ACCESSORIES AND COVER BOARD

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.

B. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
1. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.

C. Glass-Mat Gypsum Cover Board: ASTM C1177/C1177M, water-resistant gypsum substrate.

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

   a. CertainTeed; SAINT-GOBAIN.
   b. Georgia-Pacific Gypsum LLC.
   c. USG Corporation.
   d. Or Approved Equal.
2. Thickness: 1/4 inch.

3. Surface Finish: Fiberglass facer.

2.7 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads, approximately 3/16 inch thick and acceptable to roofing system manufacturer.

1. Size: Approximately 36 by 60 inches.
2. Color: Contrasting with roof membrane.

PART 3 - EXECUTION

3.1 EXAMINATION

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

1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 053100 "Steel Decking."
4. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
5. Verify that concrete substrate is visibly dry and free of moisture, and that minimum concrete internal relative humidity is not more than 75 percent, or as recommended by roofing system manufacturer when tested in accordance with ASTM F2170.

    a. Test Frequency: One test probe per each 1000 sq. ft., or portion thereof, of roof deck, with not less than three test probes.
    b. Submit test reports within 24 hours of performing tests.

6. Verify that concrete-curing compounds that will impair adhesion of roofing components to roof deck have been removed.
7. Verify that joints in precast concrete roof decks have been grouted flush with top of concrete.

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

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation in accordance with roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

3.3 INSTALLATION OF ROOFING, GENERAL

A. Install roofing system in accordance with roofing system manufacturer's written instructions, FM Approvals' RoofNav assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.4 INSTALLATION OF VAPOR RETARDER

A. Self-Adhering-Sheet Vapor Retarder: Prime substrate if required by manufacturer. Install self-adhering-sheet vapor retarder over area to receive vapor retarder, side and end lapping each sheet a minimum of 3-1/2 and 6 inches, respectively.

1. Extend vertically up parapet walls and projections to a minimum height equal to height of insulation and cover board.
2. Seal laps by rolling.

B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into roofing system.

3.5 INSTALLATION OF INSULATION

A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.

B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Installation Over Concrete Decks:

1. Install base layer of insulation with joints staggered not less than 24 inches in adjacent rows.
    a. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
    b. Make joints between adjacent insulation boards not more than 1/4 inch in width.
    c. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.

        1) Trim insulation so that water flow is unrestricted.

    d. Fill gaps exceeding 1/4 inch with insulation.
    e. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

f. Adhere base layer of insulation to vapor retarder in accordance with FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and FM Global Property Loss Prevention Data Sheet 1-29, as follows:
   1) Set insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.

2. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches from previous layer of insulation.

   a. Staggered end joints within each layer not less than 24 inches in adjacent rows.
   b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
   c. Make joints between adjacent insulation boards not more than 1/4 inch in width.
   d. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.

      1) Trim insulation so that water is unrestricted.

   e. Fill gaps exceeding 1/4 inch with insulation.
   f. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
   g. Adhere each layer of insulation to substrate using adhesive in accordance with FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and FM Global Property Loss Prevention Data Sheet 1-29, as follows:
      1) Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.

3.6 INSTALLATION OF COVER BOARDS

A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction.

   1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
   2. At internal roof drains, conform to slope of drain sump.

      a. Trim cover board so that water flow is unrestricted.

   3. Cut and fit cover board tight to nailers, projections, and penetrations.
   4. Adhere cover board to substrate using adhesive in accordance with FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and FM Global Property Loss Prevention Data Sheet 1-29, as follows:
      a. Set cover board in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.

3.7 INSTALLATION OF SELF-ADHERING ROOF MEMBRANE

A. Adhere roof membrane over area to receive roofing in accordance with roofing system manufacturer's written instructions.

B. Unroll roof membrane and allow to relax before installing.

C. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Fold roof membrane to expose half of sheet width's bottom surface.

1. Remove release liner on exposed half of sheet.
2. Roll roof membrane over substrate while avoiding wrinkles.

E. Fold remaining half of roof membrane to expose bottom surface.

1. Remove release liner on exposed half of sheet.
2. Roll roof membrane over substrate while avoiding wrinkles.

F. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeter of roofing.

G. Apply roof membrane with side laps shingled with slope of roof deck where possible.

H. Factory-Applied Seam Tape Installation: Clean and prime surface to receive tape.

1. Firmly roll side and end laps of overlapping roof membrane to ensure a watertight seam installation.
2. Apply lap sealant and seal exposed edges of roofing terminations.

I. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.

J. Spread sealant or mastic bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

3.8 INSTALLATION OF BASE FLASHING

A. Install sheet flashings and preformed flashing accessories, and adhere to substrates in accordance with roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.9 INSTALLATION OF WALKWAYS

A. Flexible Walkways: Install walkway products in accordance with manufacturer's written instructions.

1. Install flexible walkways at the following locations:
   a. Locations indicated on Drawings.
   b. As required by roof membrane manufacturer's warranty requirements.

2. Provide 6-inch clearance between adjoining pads.
3. Adhere walkway products to substrate with compatible adhesive in accordance with roofing system manufacturer's written instructions.

3.10 FIELD QUALITY CONTROL

A. Perform the following tests:

B. Final Roof Inspection by Manufacturer: Provide final inspection by a Technical Representative employed by the roofing system Manufacturer specifically to inspect and provide a report on the installation for warranty purposes (e.g., not a sales representative).

C. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.11 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing system, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and in accordance with warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.12 ROOFING INSTALLER'S WARRANTY

A. WHEREAS _____ of _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner: Village of Ossining.
2. Owner Address: 16 Croton Avenue, Ossining, New York 10562
3. Building Name/Type: Transportation Hub.
4. Building Address: Brandreth St. & Leornard St.
5. Area of Work: Stair tower roofs
6. Acceptance Date: Date of substantial Completion.
7. Warranty Period: 20 yr.

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period Roofing Installer will, at Roofing Installer's own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:

    a. lightning;
    b. peak gust wind speed exceeding 100 mph;
    c. fire;
    d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
    e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
    f. vapor condensation on bottom of roofing; and
    g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent

said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.

5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this _____ day of _____, _____.

1. Authorized Signature: _____.
2. Name: _____.
3. Title: _____.

END OF SECTION 075323

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Custom flashing and trim fabrications, made from the following:

1. Sheet metal materials.
2. Underlayment.
3. Miscellaneous materials.

B. Related Requirements:

1. Section 061053 "Misc. Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 077100 "Roof Specialties" for manufactured copings, roof-edge specialties, roof-edge drainage systems, reglets, and counterflashings.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
3. Review requirements for insurance and certificates if applicable.
4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For sheet metal flashing and trim.

1. Plans, elevations, sections, and attachment details.
2. Fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
3. Identification of material, thickness, weight, and finish for each item and location in Project.
4. Details for forming, including profiles, shapes, seams, and dimensions.
5. Details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Details of termination points and assemblies.
7. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Details of roof-penetration flashing.

9. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, flashings, and counterflashings.
10. Details of special conditions.
11. Details of connections to adjoining work.
12. Formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches.

C. Samples: For each exposed product and for each color and texture specified, 12 inches long by actual width.

D. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of exposed finish.

E. Samples for Verification: Actual sample of finished products for each type of exposed finish for sheet metal and other metal accessories.

1. Sheet Metal Flashing and Trim: Manufacturers' standard size. Include finished seam with required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Anodized Aluminum Samples: Samples to show full range to be expected for each color required.

1.4 INFORMATIONAL SUBMITTALS

A. Certificates: For each type of coping and roof edge flashing that is ANSI/SPRI/FM 4435/ES-1 tested and FM Approvals approved.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Research Reports: For copings and roof edge flashing, from an agency acceptable to authority having jurisdiction showing compliance with ANSI/SPRI/FM 4435/ES-1.

D. Qualification Statements: For fabricator.

E. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Entity that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

B. Installer Qualifications: Entity that employs a supervisor who is an NRCA ProCertified Roofing Foreman.

C. For roof edge flashings and copings that are ANSI/SPRI/FM 4435/ES-1 tested and FM Approvals approved, shop is to be listed as able to fabricate required details as tested and approved.

1.7 MOCKUPS

A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockup of typical roof edge, including fascia, approximately 10 ft. long, including supporting construction cleats, seams, attachments, underlayment, and accessories.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
2. Protect stored sheet metal flashing and trim from contact with water.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.9 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, are to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim are not to rattle, leak, or loosen, and are to remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. SPRI Wind Design Standard: Manufacture and install roof edge flashings and copings tested in accordance with ANSI/SPRI/FM 4435/ES-1 and capable of resisting the following design pressure:

1. Design Pressure: As indicated on Drawings.

D. FM Approvals Listing: Manufacture and install roof edge flashings and copings that comply with requirements in FM Approvals 4471 as part of a roofing system and that are listed in FM Approvals' "Approval Guide" and approved for windstorm classification, Class 1A-60. Identify materials with name of fabricator and design approved by FM Approvals.

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F (100 deg C), material surfaces.

2.2 SHEET METAL MATERIALS

A. Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with minimum ASTM A653/A653M, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with minimum ASTM A792/A792M, Class AZ50 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.

1. Nominal Thickness: 0.028 inch.
2. Surface: Smooth, flat.
3. Exposed Coil-Coated Finish:

a. Two-Coat Fluoropolymer: Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

4. Color: As selected by Architect from manufacturer's full range.

5. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

2.3 UNDERLAYMENT

1. Source Limitations: Obtain underlayment from single source from single manufacturer.

B. Self-Adhering, High-Temperature Sheet Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils thick, specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at 240 deg F; ASTM D1970/D1970M.
2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F or lower; ASTM D1970/D1970M.

C. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. minimum, of type required for application.

2.4 MISCELLANEOUS MATERIALS

A. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

    a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
    b. Blind Fasteners: High-strength aluminum or stainless steel rivets suitable for metal being fastened.
    c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

2. Fasteners for Zinc-Coated (Galvanized) or Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel in accordance with ASTM A153/A153M or ASTM F2329/F2329M.
3. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
4. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

D. Elastomeric Sealant: ASTM C920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

F. Bituminous Coating: Cold-applied asphalt emulsion in accordance with ASTM D1187/D1187M.

2.5 FABRICATION, GENERAL

A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.

1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances:

1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 ft. on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
2.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

G. Seams:
1. Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

H. Do not use graphite pencils to mark metal surfaces.

2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Downspouts: Fabricate rectangular downspouts to dimensions indicated on Drawings, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors.

1. Fabricated Hanger Style: Fig. 1-35A in accordance with SMACNA's "Architectural Sheet Metal Manual."
2. Fabricate from the following materials:

a. Aluminum: 0.024 inch thick.

B. Parapet Scuppers: Fabricate scuppers to dimensions required, with closure flange trim to exterior, 4-inch-wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof. Fabricate from the following materials:

1. Aluminum: 0.032 inch thick.

C. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes, exterior flange trim, and built-in overflows. Fabricate from the following materials:

1. Aluminum: 0.032 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

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

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
3. Verify that air- or water-resistant barriers have been installed over substrate to prevent air infiltration or water penetration.

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

3.2 INSTALLATION OF UNDERLAYMENT

A. Self-Adhering, High-Temperature Sheet Underlayment:

1. Install self-adhering, high-temperature sheet underlayment; wrinkle free.
2. Prime substrate if recommended by underlayment manufacturer.
3. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures.
4. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses.
5. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller.
6. Roll laps and edges with roller.
7. Cover underlayment within 14 days.

B. Install slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

1. Install in shingle fashion to shed water.
2. Lapp joints not less than 4 inches.

3.3 INSTALLATION OF SHEET METAL FLASHING AND TRIM, GENERAL

A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.

1. Install fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of sealant.
3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
5. Install continuous cleats with fasteners spaced not more than 12 inches o.c.
6. Space individual cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
7. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
8. Do not field cut sheet metal flashing and trim by torch.
9. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of uncoated-aluminum sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.

1. Space movement joints at maximum of 10 ft. with no joints within 24 inches of corner or intersection.
2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
3. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated.
   a. Form joints to completely conceal sealant.
   b. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way.
   c. Adjust setting proportionately for installation at higher ambient temperatures.

      1) Do not install sealant-type joints at temperatures below 40 deg F.

2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

3.4 INSTALLATION OF ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Install sheet metal roof-drainage items to produce complete roof-drainage system in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Downspouts:

1. Join sections with 1-1/2-inch telescoping joints.
2. Provide hangers with fasteners designed to hold downspouts securely to walls.
3. Locate hangers at top and bottom and at approximately 60 inches o.c.
4. Connect downspouts to top tier drainage boots which connect to stormwater drainage system.
5. Connect downspouts to underground drainage system.

C. Parapet Scuppers:

1. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
2. Anchor scupper closure trim flange to exterior wall and seal with elastomeric sealant to scupper.
3. Loosely lock front edge of scupper with conductor head.

4. Seal with elastomeric sealant exterior wall scupper flanges into back of conductor head.

D. Conductor Heads: Anchor securely to wall, with elevation of conductor head rim at minimum of 1 inch below scupper discharge.

E. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated on Drawings. Lap joints minimum of 4 inches in direction of water flow.

3.5 INSTALLATION OF WALL SHEET METAL FABRICATIONS

A. Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

C. Reglets: Installation of reglets is specified in Section 033000 "Cast-in-Place Concrete." Section 042000 "Unit Masonry."

3.6 INSTALLATION TOLERANCES

A. Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 ft. on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.7 CLEANING

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean off excess sealants.

3.8 PROTECTION

A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

B. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.

C. Maintain sheet metal flashing and trim in 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, as determined by Architect.

END OF SECTION 076200

SECTION 077100 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Manufactured units for the following applications:

1. Roof-edge specialties.
2. Roof-edge drainage systems.
3. Reglets and counterflashings.
4. Underlayment.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for installing embedded reglets.
2. Section 042000 "Unit Masonry" for installing embedded reglets and for masonry through-wall flashing with receiver for counterflashing.
3. Section 055000 "Metal Fabrications" for downspout guards and downspout boots.
4. Section 061053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
5. Section 076200 "Sheet Metal Flashing and Trim" for custom- and site-fabricated, sheet metal flashing and trim.
6. Section 077200 "Roof Accessories" for manufactured roof curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
7. Section 079200 "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, roofing-system testing and inspecting agency representative, roofing Installer, roofing-system manufacturer's representative, Installer, structural-support Installer, and installers whose work interfaces with or affects roof specialties, including installers of roofing materials and accessories.
2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
3. Review special roof details, roof drainage, and condition of other construction that will affect roof specialties.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of roof specialty.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof specialties.

1. Plans, expansion-joint locations, keyed details, and attachments to other work. Distinguish between factory pre manufactured- and field-assembled installation.
2. Details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
4. Details of termination points and assemblies, including fixed points.
5. Details of special conditions.

C. Samples: For each type of roof specialty and for each color and texture specified.

D. Samples for Verification:

1. Include Samples of each type of roof specialty to verify finish and color selection, in manufacturer's standard sizes.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of roof specialty copings and roof-edge flashings that is ANSI/SPRI/FM 4435/ES-1 tested and FM Approvals approved.

B. Product Test Reports: For copings and roof-edge flashings, for tests performed by a qualified testing agency.

C. Research Reports: For copings and roof-edge flashings, from an agency acceptable to authorities having jurisdiction showing compliance with ANSI/SPRI/FM 4435/ES-1.

D. Qualification Statements: For manufacturer.

E. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roof specialties.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer offering products that are FM Approvals listed for specified class and ANSI/SPRI/FM 4435/ES-1 tested to specified design pressure.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof-specialty installation.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.9 COORDINATION

A. Coordinate roof specialties with roofing system, exterior wall system, air barrier, flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, weathertight, secure, and noncorrosive installation.

1. Performance Coordination: Coordinate with the Work of roofing and exterior wall Sections to ensure that roof specialties provided under the Work of this Section meet or exceed specified roofing and exterior wall design performance requirements.

B. Confirm and coordinate compatibility of materials and comply with warranty requirements of roofing system manufacturer.

C. Coordinate roof specialties layout and seams with sizes and locations of joints and seams in adjacent materials.

1.10 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer agrees to repair finishes or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof specialties to withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. FM Approvals' Listing: Manufacture and install roof-edge specialties that are listed in FM Approvals' "Approval Guide" and approved for windstorm classification. Class as required per project location. Identify materials with FM Approvals' markings.

C. SPRI Wind Design Standard: Manufacture and install roof-edge specialties tested in accordance with ANSI/SPRI/FM 4435/ES-1 and capable of resisting the following design pressures:

1. Design Pressure: As indicated on Drawings.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent 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 thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 ROOF-EDGE SPECIALTIES

A. Canted Roof-Edge Fascia and Gravel Stop: Manufactured, two-piece, roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 ft. and a continuous formed galvanized-steel sheet cant, 0.028 inch thick, minimum, with extended vertical leg terminating in a drip-edge cleat. Provide matching corner units.

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

   a. ATAS International, Inc.
   b. Architectural Products Company.
   c. Castle Metal Products.
   d. Metal-Era, Inc.
   e. Or Approved Equal.

2. Formed Aluminum Fascia Covers: Aluminum sheet, thickness as required to meet performance requirements.

   a. Surface: Smooth, flat finish.
   b. Finish: Two-coat fluoropolymer.
   c. Color: As selected by Architect from manufacturer's full range.

3. Corners: Factory mitered and continuously welded.
4. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.
5. Fascia Accessories: Fascia extenders with continuous hold-down cleats Wall cap Soffit trim Overflow scuppers Overflow scuppers with perforated screens Spillout scuppers Downspout scuppers with integral conductor head and downspout adapters Downspout scuppers with integral conductor head and downspout adapters and perforated screens.

B. Roof-Edge Fascia: Manufactured, two-piece, roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 ft. and a continuous metal receiver with integral drip-

edge cleat to engage fascia cover and secure single-ply roof membrane. Provide matching corner units.

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

   a. ATAS International, Inc.
   b. Metal-Era, Inc.
   c. Or Approved Equal.

2. Formed Aluminum Fascia Covers: Aluminum sheet, thickness as required to meet performance requirements.

   a. Surface: Smooth, flat finish.
   b. Finish: Two-coat fluoropolymer.
   c. Color: As selected by Architect from manufacturer's full range.

3. Corners: Factory mitered and continuously welded.
4. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.
5. Receiver: Manufacturer's standard material and thickness.
6. Fascia Accessories: Fascia extenders with continuous hold-down cleats Wall cap Soffit trim Overflow scuppers Overflow scuppers with perforated screens Spillout scuppers Downspout scuppers with integral conductor head and downspout adapters Downspout scuppers with integral conductor head and downspout adapters and perforated screens.

2.3 ROOF-EDGE DRAINAGE SYSTEMS

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

1. Architectural Products Company.
2. ATAS International, Inc.
3. Castle Metal Products.
4. Metal-Era, Inc.
5. Or Approved Equal.

B. Downspouts: Plain rectangular complete with mitered elbows, manufactured from the following exposed metal. Furnish with metal hangers, from same material as downspouts, and anchors.
   1. Formed Aluminum Sheet: 0.050 inch thick.

C. Parapet Scuppers: Manufactured with closure flange trim to exterior, 4-inch- wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof.
   1. Formed Aluminum Sheet: 0.063 inch thick.

D. Conductor Heads: Manufactured conductor heads, each with flanged back and stiffened top edge, and of dimensions and shape indicated, complete with outlet tube that nests into upper end of downspout.
   1. Formed Aluminum Sheet: 0.063 inch thick.

E. Finishes:

1. Aluminum: Two-coat fluoropolymer.

a. Color: As selected by Architect from manufacturer's full range.

2.4 REGLETS AND COUNTERFLASHINGS

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

1. Castle Metal Products.
2. Fry Reglet Corporation.
3. Metal-Era, Inc.
4. OMG, Inc.
5. Or Approved Equal.

B. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, from the following exposed metal:
1. Formed Aluminum Sheet: 0.050 inch thick.
2. Corners: Factory mitered and continuously welded.
3. Surface-Mounted Type: Provide reglets with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.

C. Counterflashings: Manufactured units of heights to overlap top edges of base flashings by 4 inches and in lengths not exceeding 12 ft. designed to snap into reglets or through-wall-flashing receiver and compress against base flashings with joints lapped, from the following exposed metal:
1. Formed Aluminum Sheet: 0.040 inch thick.

D. Accessories:

1. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where reglet is provided separate from metal counterflashing.
2. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

E. Finishes:

1. Aluminum: Two-coat fluoropolymer.

a. Color: As selected by Architect from manufacturer's full range.

2.5 SHEET METAL MATERIALS

A. Aluminum Sheet: ASTM B209/B209M, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.

1. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A755/A755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

    a. Two-Coat Fluoropolymer Finish: AAMA 2605. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight in color coat.

B. Aluminum Extrusions and Tubes: ASTM B221, manufacturer's standard alloy and temper for type of use, finished to match assembly where used; otherwise, mill finished.

2.6 UNDERLAYMENT

A. Self-Adhering, High-Temperature Sheet Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum 30 mils thick, specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at 240 deg F; ASTM D1970/D1970M.
2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F or lower; ASTM D1970/D1970M.
3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. GCP
    b. Johns Manville
    c. Polyglass, MAPEI Group
    d. New Castle Building Products
    e. Or Approved Equal.

B.

C. Slip Sheet: Rosin-sized building paper, 3-lb/100 sq. ft. minimum.

2.7 MISCELLANEOUS MATERIALS

A. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Fasteners: Roof specialty manufacturer's recommended fasteners, designed to meet performance requirements, suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
1. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
2. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.

C. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

D. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.

E. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type joints with limited movement.

F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

G. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.

2.8 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.

C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.

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

3.2 INSTALLATION OF UNDERLAYMENT

A. Self-Adhering, High-Temperature Sheet Underlayment:

1. Install self-adhering, high-temperature sheet underlayment; wrinkle free.
2. Prime substrate if recommended by underlayment manufacturer.
3. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures.
4. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses.
5. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller.

6. Roll laps and edges with roller.
7. Cover underlayment within 14 days.

B. Slip Sheet: Install slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

1. Install in shingle fashion to shed water.
2. Lapp joints not less than 4 inches.

3.3 INSTALLATION, GENERAL

A. Install roof specialties in accordance with manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.

1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
2. Provide uniform, neat seams with minimum exposure of solder and sealant.
3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
4. Torch cutting of roof specialties is not permitted.
5. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer's written installation instructions.

1. Coat concealed side of uncoated aluminum and stainless steel roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.

1. Space movement joints at a maximum of 12 ft. with no joints within 18 inches of corners or intersections unless otherwise indicated on Drawings.
2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

D. Fastener Sizes: Use fasteners of sizes that penetrate substrate not less than recommended in writing by fastener manufacturer to achieve maximum pull-out resistance.

E. Seal concealed joints with butyl sealant as required by roof specialty manufacturer.

F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

G. 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; however, reduce pre-tinning where pre-tinned surface would show in completed Work. Tin edges of uncoated copper sheets using solder for copper. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

3.4 INSTALLATION OF COPINGS

A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor copings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

1. Interlock face and back leg drip edges of snap-on coping cap into cleated anchor plates anchored to substrate at manufacturer's required spacing that meets performance requirements.

3.5 INSTALLATION OF ROOF-EDGE SPECIALTIES

A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

3.6 INSTALLATION OF ROOF-EDGE DRAINAGE SYSTEMS

A. Install components to produce a complete roof-edge drainage system in accordance with manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.

B. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch away from walls; locate fasteners at top and bottom and at approximately [60 inches] o.c.
1. Connect downspouts to underground garage stormwater drainage system indicated.

C. Parapet Scuppers: Install scuppers through parapet where indicated. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
1. Seal or solder exterior wall scupper flanges into back of conductor head.

D. Conductor Heads: Anchor securely to wall with elevation of conductor top edge 1 inch below scupper discharge.

3.7 INSTALLATION OF REGLETS AND COUNTERFLASHINGS

A. Coordinate installation of reglets and counterflashings with installation of base flashings.

B. Surface-Mounted Reglets: Install reglets to receive flashings where flashing without embedded reglets is indicated on Drawings. Install at height so that inserted counterflashings overlap 4 inches over top edge of base flashings.

C. Counterflashings: Insert counterflashings into reglets or other indicated receivers; ensure that counterflashings overlap 4 inches over top edge of base flashings. Lap counterflashing joints a minimum of 4 inches and bed with butyl sealant. Fit counterflashings tightly to base flashings.

3.8 CLEANING AND PROTECTION

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing in accordance with ASTM A780/A780M.

B. Touch up factory-primed surfaces with compatible primer ready for field painting in accordance with applicable Painting Specification Section for exterior conditions.

C. Clean and neutralize flux materials. Clean off excess solder and sealants.

D. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.

E. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION 077100

SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Manufactured units for the following applications:

1. Roof curbs.
2. Roof hatches.
3. Gravity ventilators.
4. Underlayment.
5. Miscellaneous materials.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for metal vertical ladders, ships' ladders, and stairs for access to roof hatches.
2. Section 061053 "Miscellaneous Rough Carpentry" for roof cants, nailers, blocking, and other pressure-preservative-treated wood.
3. Section 077100 "Roof Specialties" for manufactured copings, roof-edge specialties, roof-edge drainage systems, reglets, and counterflashing.
4. Section 079200 "Joint Sealants" for field-applied sealants between roof accessories and adjacent materials.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of roof accessory.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof accessories.

1. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.

C. Samples: For each type of roof accessory and for each color and texture specified.

D. Samples for Initial Selection: For each type of roof accessory indicated with factory-applied color finishes.

E. Samples for Verification: Include Samples of each type of roof accessory to verify finish and color selection, in manufacturer's standard sizes.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:

1. Size and location of roof accessories specified in this Section.
2. Method of attaching roof accessories to roof or building structure.
3. Other roof-mounted items, including mechanical and electrical equipment, ductwork, piping, and conduit.
4. Required clearances.

B. Qualification Statements: For manufacturerand Installer.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roof accessories.

1.5 QUALITY ASSURANCE

A. Delegated Design Engineer Qualifications: A professional engineer who is legally qualified to practice in state where Project is located and who is experienced in providing engineering services of the type indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store roof accessories in contact with other materials that might cause staining, denting, or other surface damage. Store roof accessories in accordance with manufacturer's instructions.

B. Store materials off ground in dry location and in accordance with manufacturer's instructions in well-ventilated area.

C. Store and protect roof accessories from nicks, scratches, and blemishes.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify profiles and tolerances of roof-accessory substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.8 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof accessories to withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. Wind-Restraint Performance: As indicated on Drawings.

2.2 ROOF CURBS

A. Internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings, bearing continuously on roof structure, and capable of meeting performance requirements; with welded or mechanically fastened and sealed corner joints, straight sides, and integrally formed deck-mounting flange at perimeter bottom.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Greenheck
    b. Kingspan
    c. Pate Company (The)
    d. Or Approved Equal.

B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.

C. Supported Load Capacity: Coordinate load capacity with information on Shop Drawings of equipment to be supported.

D. Steel: Zinc-coated (galvanized) steel sheet, 0.079 inch thick.

1. Finish: Powder coat .
2. Color: As selected by Architect from manufacturer's full range.

E. Construction:

1. Curb Profile: Profile as indicated on Drawings compatible with roofing system.
2. Fabricate curbs to minimum height of 12 inches above roofing surface unless otherwise indicated.
3. Top Surface: Level top of curb, with roof slope accommodated by sloping deck-mounting flange or by use of leveler frame.
4. Sloping Roofs: Where roof slope exceeds 1/4 inch per 12 inches, fabricate curb with perimeter curb height tapered to accommodate roof slope so that top surface of perimeter curb is level. Equip unit with water diverter or cricket on side that obstructs water flow.

5. Nailer: Factory-installed wood nailer along top flange of curb, continuous around curb perimeter.
6. Wind-Restraint Straps and Base Flange Attachment: Provide wind-restraint straps, welded strap connectors, and base flange attachment to roof structure at perimeter of curb, of size and spacing required to comply with wind-uplift requirements.
7. Platform Cap: Where portion of roof curb is not covered by equipment, provide weathertight platform cap formed from 3/4-inch- thick plywood covered with metal sheet of same type, thickness, and finish as required for curb.
8. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as curb.

2.3 ROOF HATCHES

A. Metal roof-hatch units with lids and insulated curbs, welded corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, and integrally formed deck-mounting flange at perimeter bottom.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. BILCO Company (The).
b. Babcock-Davis.
c. Nystrom, Inc.
d. Williams Brothers Corporation of America.
e. Or Approved Equal.

B. Type and Size:

1. Single-leaf lid, 48 by 48 inches.

C. Loads: Minimum 40 lbf/sq. ft. external live load and 20 lbf/sq. ft. internal uplift load.

D. Hatch Material, Aluminum:

1. Thickness: Manufacturer's standard thickness for hatch size indicated.
2. Finish: [Mill].

E. Construction:

1. Insulation: 1-inch- thick, manufacturer’s standard rigid board.

2. Nailer: Factory-installed wood nailer continuous around hatch perimeter.
3. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
4. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
5. Fabricate curbs to minimum height of 12 inches above roofing surface unless otherwise indicated.
6. Sloping Roofs: Where slope or roof deck exceeds 1/4 inch per 12 inches, fabricate curb with perimeter curb height that is tapered to accommodate roof slope so that top surfaces

of perimeter curb are level. Equip hatch with water diverter or cricket on side that obstructs water flow.

F. Hardware: Spring operators, hold-open arm, stainless steel spring latch with turn handles, stainless steel butt- or pintle-type hinge system, and padlock hasps inside and outside.

1. Provide two-point latch on lids larger than 84 inches.

G. Safety Railing System: Roof-hatch manufacturer's standard system, including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.

1. Height: 42 inches above finished roof deck.
2. Posts and Rails: Galvanized-steel pipe, 1-1/4 inches in diameter or galvanized-steel tube, 1-5/8 inches in diameter.
3. Flat Bar: Galvanized steel, 2 inches high by 3/8 inch thick.
4. Maximum Opening Size: System constructed to prevent passage of a sphere 21 inches in diameter.
5. Chain Passway Barrier: Galvanized proof coil chain with quick link on fixed end.
6. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.
7. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end fittings.
8. Provide weep holes or another means to drain-entrapped water in hollow sections of handrail and railing members.
9. Fabricate joints exposed to weather to be watertight.
10. Fasteners: Manufacturer's standard, finished to match railing system.
11. Finish: Manufacturer's standard.

a. Color: As selected by Architect from manufacturer's full range.

H. Ladder-Assist Post: Roof-hatch manufacturer's standard device for attachment to roof-access ladder.

1. Operation: Post locks in place on full extension; release mechanism returns post to closed position.
2. Height: 42 inches above finished roof deck.
3. Material: Manufacturer’s standard..
4. Post: 1-5/8-inch- diameter pipe.
5. Finish: Manufacturer's standard.

a. Color: As selected by Architect from manufacturer's full range.

2.4 GRAVITY VENTILATORS

A. Louvered Penthouse-Style Gravity Ventilators: Manufacturer's standard, fabricated as indicated, with manufacturer's standard welded or sealed mechanical joints.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Greenheck Fan Corporation.
    b. Loren Cook Company.
    c. Romlair Ventilator Co.
    d. Or Approved Equal.
2. Construction: Integral frame with base flange, weathertight cap with precision formed, arched panels with interlocking seams..
3. Dimensions: As indicated on Drawings.
4. Configuration: As indicated on Drawings.
5. Bird Screens: Manufacturer's standard mesh with rewireable frame.
6. Insect Screens: Manufacturer's standard mesh with rewireable frame.
7. Frame, Base Flange, Cap, and Louver Material: Aluminum sheet, of manufacturer's standard thickness.
8. Finish: As indicated by manufacturer's designations.

2.5 METAL MATERIALS

A. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheer complying with minimum ASTM A653/A653M, G90 coating designation or aluminum-zinc alloy-coated steel sheet complying with minimum ASTM A792/A792M, Class AZ50 coating designation; structural quality.
    1. Powder Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils.

B. Aluminum Sheet: ASTM B209/B209M, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.

    1. Mill Finish: As manufactured.
    2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil.

C. Aluminum Extrusions and Tubes: ASTM B221, manufacturer's standard alloy and temper for type of use, finished to match assembly where used; otherwise mill finished.

D. Stainless Steel Sheet and Shapes: ASTM A240/A240M or ASTM A666, Type 304.

E. Steel Shapes: ASTM A36/A36M, hot-dip galvanized in accordance with ASTM A123/A123M unless otherwise indicated.

F. Steel Tube: ASTM A500/A500M, round tube.

G. Galvanized-Steel Tube: ASTM A500/A500M, round tube, hot-dip galvanized in accordance with ASTM A123/A123M.

H. Steel Pipe: ASTM A53/A53M, galvanized.

2.6 UNDERLAYMENT

A. Self-Adhering, High-Temperature Sheet Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils thick, specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at 240 deg F; ASTM D1970/D1970M.
2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F or lower; ASTM D1970/D1970M.

3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. GCP Applied Technologies, Inc.
   b. Henry Company.
   c. ATAS International, Inc.
   d. Or Approved Equal.

4.

B. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. minimum.

2.7 MISCELLANEOUS MATERIALS

A. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inches thick.

C. Fasteners: Roof accessory manufacturer's recommended fasteners, designed to comply with performance requirements, suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:

1. Fasteners for Metallic-Coated Steel Sheet: Series 300 stainless steel or hot-dip zinc-coated steel in accordance with ASTM A153/A153M or ASTM F2329/F2329M.
2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
3. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.

D. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

E. Elastomeric Sealant: ASTM C920, elastomeric polyurethane polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.

F. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

G. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

H. Asphalt Roofing Cement: ASTM D4586/D4586M, asbestos free, of consistency required for application.

2.8 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA AMP 500, "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

C. Verify dimensions of roof openings for roof accessories.

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

3.2 INSTALLATION OF UNDERLAYMENT

A. Self-Adhering, High-Temperature Sheet Underlayment:

1. Install self-adhering, high-temperature sheet underlayment; wrinkle free.
2. Prime substrate if recommended by underlayment manufacturer.
3. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures.
4. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses.
5. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller.
6. Roll laps and edges with roller.
7. Cover underlayment within 14 days.

B. Slip Sheet: Install slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

1. Install in shingle fashion to shed water.
2. Lapp joints not less than 4 inches.

3.3 INSTALLATION, GENERAL

A. Install roof accessories in accordance with manufacturer's written instructions.

1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended in writing by manufacturer's written installation instructions.

1. Coat concealed side of uncoated aluminum and stainless steel roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.

3.4 INSTALLATION OF ROOF ACCESSORIES

A. Roof Curb: Install each roof curb so top surface is level.

B. Roof-Hatch:

1. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
2. Attach safety railing system to roof-hatch curb.
3. Attach ladder-assist post in accordance with manufacturer's written instructions.

C. Gravity Ventilator: Verify that gravity ventilators operate properly and have unrestricted airflow.

D. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

3.5 CLEANING AND PROTECTION

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing in accordance with ASTM A780/A780M.

B. Touch up factory-primed surfaces with compatible primer ready for field painting in accordance with applicable paint specification for exterior conditions."

C. On completion of installation, clean exposed surfaces in according with manufacturer's written instructions. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as roof accessories are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof accessories in a clean condition during construction.

E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION 077200

SECTION 079020 - GARAGE WATERPROOFING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This section includes the following:

1. Protective concrete sealer system.
2. Elastomeric traffic deck coating system.
3. Slab and deck joint sealant system.
4. Structural expansion joint system.

B. Related Sections include the following:

1. Division 3 Section "Cast-in-place Concrete".
2. Division 3 Sections " Precast Concrete ".
3. Division 7 Section "Joint Sealants".

1.3 SUBMITTALS

A. General: Submit the following in accordance with the Conditions of the Contract and Division 1 Specification sections.

B. Product Data: For each product indicated.

C. A detailed statement describing the deck waterproofing system to be installed, as well as the installation methods to be employed, shall be submitted for approval prior to installation. Literature, details, samples, shop drawings, warranties, etc., shall be included in the submittal as requested.

D. A manufacturer's written acceptance and approval of the intended system applicator shall be required.

E. Qualification Data: For Installer and testing agency.

F. Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate: For each sealant specified to be validated by SWRI's Sealant Validation Program.

G. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that products comply with requirements.

H. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of waterproofing systems required for this Project.

B. Source Limitations: Obtain each type of product through one source from a single manufacturer.

C. A site inspection shall be made by applicator prior to commencing installation of the system for purposes of reviewing related conditions affecting performance requirements of this specification.

D. All products described in this section must be used with adequate ventilation and personal protection. Refer to the Material Safety Data Sheet which accompanies each product shipment for detailed health and safety information prior to use.

E. At Architect’s option, Testing Agency shall take one core from each trial section per Section 3.3.C to test for sealer effectiveness in accordance with ASTM C642. Such cores will then serve as “base cores” for which the remainder of sealer application will be tested. At Architect’s direction, additional cores shall be taken randomly for testing comparison with the “base cores”.

F. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

G. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period preceding the commencement of the Work.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
3. Test elastomeric joint sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.
4. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.

H. Mockups: Build mockups incorporating products, as follows, to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:

1. Joint sealants in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.
2. Joint sealants - Provide two 4’ long mockups for each joint sealant and each substrate.
3. Deck coating systems - Provide two 4’x4’ mockups for each deck coating system and each substrate.
4. Structural expansion joint system – 6 lf for each type, including transition details.
5. Expansion joint nosing material - Provide two mockups of size required for adhesion testing for each nosing material and each substrate.

I. Preconstruction Field-Adhesion and Slip Resistance Testing: Before installing elastomeric sealants, deck coating, and expansion joint nosing material, perform field tests as follows:

1. Locate field test mockup where indicated or, if not indicated, as directed by Architect.
2. Conduct field-adhesion tests for each application indicated below:

    a. Each type of elastomeric sealant indicated and the applicable joint substrates.
    b. Each type of nonelastomeric sealant indicated and the applicable joint substrates.
    c. Each type of deck coating indicated and the applicable substrates.
    d. Each type of expansion joint nosing material indicated and the applicable substrates.

3. Conduct field slip resistance tests for each application indicated below:

    a. Each type of deck coating indicated and the applicable substrates.

4. Notify Architect seven days in advance of dates and times when tests will be performed.
5. Arrange for tests to take place with product manufacturer's technical representative present.

6. Refer to Field Quality Control under Part 3 for additional requirements.

J. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.5 PERFORMANCE REQUIREMENTS

A. Provide products that establish and maintain watertight and airtight continuous waterproofing system without staining or deteriorating joint substrates.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Apply waterproofing systems within the range of ambient and substrate temperatures recommended in writing by manufacturer. Do not apply waterproofing systems to damp or wet substrates, when temperatures are below 40 deg F, when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F above dew point.

B. Do not proceed with installation of waterproofing systems under the following conditions:

1. Do not apply waterproofing systems in snow, rain, fog, or mist, or when such weather conditions are imminent during the application and curing period. Apply only when frost-free conditions occur throughout the depth of substrate.
2. Contaminants capable of interfering with adhesion have not yet been removed from substrates.
3. Where conditions exist that do not meet the manufacturer's requirements for applications indicated.
4. Where conditions exist that can cause off gassing of the waterproofing systems.

C. Do not install waterproofing systems until items that penetrate the waterproofing have been installed.

1.7 WARRANTY

A. The system manufacturer and the approved applicator shall furnish a written performance joint warranty that, subject to certain specific exclusions as described in such joint warranty, the system provided will be free of defects related to workmanship or material deficiency. The following conditions shall be specifically covered under the joint warranty:

1. Cohesive or adhesive failure of materials.
2. Weathering deficiencies resulting in failure of the system to provide its intended function.
3. Abrasion or tear failure of the system resulting from normal traffic use. (Abrasive maintenance equipment, truck and construction traffic are not normal traffic use and related problems are exempted from the warranty.)
4. Joint Warranty Period: Refer to Section 1.7.C.1 below for joint warranty period requirements, with the exception of concrete sealer.

B. The system manufacturer and the approved applicator shall submit to the Owner for approval a detailed joint warranty statement consistent with the terms of this specification prior to construction. The approved joint warranty shall represent the sole warranty statement and warrant obligation for the project relating to this trade. Where an apparent conflict is found to exist with respect to the warranty language of this section and the detailed warranty statement, the more stringent warranty requirement shall supersede and control.

C. Special Manufacturer and Installer Joint Warranty: Manufacturer's standard form in which the Manufacturer and Installer jointly agree to furnish and repair or replace the product(s) that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Joint Warranty Period for all products listed in Part 2 of this Section, unless noted otherwise: Five years from date of Substantial Completion.

D. Special joint warranty specified in this article exclude deterioration or failure from the following:

1. Movement caused by structural settlement or errors attributable to design or construction resulting in stresses exceeding the manufacturer's written specifications for elongation and compression.

2. Disintegration from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

2.2 MATERIALS, GENERAL

A. Compatibility: Provide waterproofing systems including backings, and other related materials that are compatible with one another and with substrates under conditions of service and application, as demonstrated by the system manufacturer, based on testing and field experience.

B. Protective Concrete Sealer System:

1. Acceptable concrete sealers are listed below. Application rates and solids content shall be in accordance with certified test results on the NCHRP 244 performance criteria.
2. Four Inch Cube Tests: 75% effective in reducing water absorption when compared to an untreated control sample.
3. Southern Exposure Tests: 90% effective in reducing chloride ion content when compared to an untreated control sample.
4. The following materials are approved for usage under this section:

    a. 40% Solids Content:

        1) "Iso-Flex 618 – 40 VOC", LymTal International Inc.
        2) "Protectosil Chem-Trete BSM 40D", Evonik Industries.
        3) "MasterProtect H 440" or "MasterProtectH 440 HZ", BASF Building Systems.
        4) “Planiseal WR 40”, Mapei Corporation.
        5) "Baracade Silane 40", Euclid Chemical.
        6) "Sealmaster 40%", Kelmar Waterproofing Systems, Technical Barrier System, Inc.
        7) "Klere-Seal 940-S VOC", Pecora Corporation.
        8) “Sikagard 740W", Sika Corporation.

5. Apply Sealer to the following locations:

    a. Slab-on-grade and supported levels within the parking deck with the exception of areas that receive a coating or finish.
    b. Concrete approach drives within the construction limits.

C. Elastomeric Traffic Deck Coating:

1. Traffic deck coating systems specified herein shall be complete systems of compatible materials. Components of systems shall include a base membrane, a traffic topping and all sealants, primers, flashing, aggregates and miscellaneous materials as required by the manufacturer to complete the system.

2. Traffic deck coating systems shall meet the following slip resistance requirements:

   a. Coefficient of friction not less than 0.85 when tested under wet conditions.
   b. Variation in slip resistance test results not greater than +/- 0.10.
   c. Refer to Field Quality Control under Part 3 for additional requirements.

3. Aggregates: Aggregate type, size and gradation as recommended by system manufacturer and as needed to meet or exceed slip resistance requirements. Comply with ACI 503.3.

   a. Oven-dried, washed, angular shaped silica sand, flint, basalt or aluminum oxide aggregate applied in wear coats with minimum Mohs scale hardness as follows:

      1) Silica sand: 7 minimum
      2) Flint: 7 minimum
      3) Basalt: 7 minimum
      4) Aluminum oxide: 9 minimum

   b. Aluminum oxide powder applied in seal coat.

4. The following urethane deck coating systems are approved for usage under this section subject to compliance with requirements:

   a. Two-Component Urethane Systems:

      1) "Autogard FC", Neogard, Division of Jones-Blair.
      2) "Iso-Flex 750U", LymTal International Inc.
      3) "MasterSeal Traffic 2500", BASF Building Systems.
      4) “Mapefloor Parking Deck System – Mapefloor PU 400LV/Finish 415 NA/Finish 450”, Mapei Corporation.
      5) "Pecora-Deck 800 FC", Pecora Corporation.
      6) “Qualideck Vehicular Traffic Bearing Membrane System”, Advanced Polymer Technology Corporation.
      7) "Sikalastic 720/745", Sika Corporation.
      8) "Kelmar Merdek", Technical Barrier System, Inc.

   b. Application rates for medium and heavy duty systems: rates are for bidding purposes and are to be confirmed in the field using a 100 sf mockup.

      1) Primer: 0.33 gal. minimum per 100 sf (300 sq. ft. maximum per gal.)
      2) Polyurethane base coat: 1.33 gal. minimum per 100 sf (75 sq. ft. maximum per gal.)
      3) Polyurethane wear coat: 0.5 gal. minimum per 100 sf (200 sq. ft. maximum per gal.)

4) Broadcast aggregate into wear coat: 15 lbs. minimum per 100 sq. ft. to excess
5) 2nd Polyurethane wear coat (*for heavy duty systems*): 0.75 gal. minimum per 100 sf (133 sq. ft. maximum per gal.)
6) 2nd Broadcast aggregate into wear coat (*for heavy duty systems*): 15 lbs. minimum per 100 sq. ft. to excess
7) Polyurethane seal coat: 0.75 gal. minimum per 100 sf (133 sq. ft. maximum per gal.).

c. Where indicated, use medium-duty system for stalls and heavy-duty system for the drive and turning lanes. Where indicated, use heavy-duty system above occupied spaces and at speed ramps. Average coating thickness exclusive of aggregate:

1) Medium duty system: 46 dry mils
2) Heavy duty system: 58 dry mils

d. Use aromatic seal coat on lower tiers and 100% aliphatic seal coat on top tier.
e. Apply Urethane System to the following areas:

1) At areas over occupied spaces, conditioned spaces, rooms with equipment and as shown on the Drawings.

D. Slab and Deck Joint Sealant System:

1. Sealants specified under this section shall be a complete system of compatible materials designed to produce waterproof, traffic-bearing control joint seals as detailed in the drawings. Primers, backer rods and related miscellaneous materials shall be used as recommended by the manufacturer.
2. All materials specified herein shall be unmodified polyurethanes containing no adulterants and shall meet the standards defined in federal specification ASTM C920, Type M or S, Class 25, self-leveling and non-sag sealants.
3. The following materials are approved for usage under this section:

a. Sealant for Horizontal (Non-Cove) Joints:

1) "Iso-Flex 880GB/881/830", LymTal International Inc.
2) "Dynatred", Pecora Corporation.
3) "MasterSeal SL 2", BASF Building Systems.
4) "THC900/THC901" or "Vulkem 45 SSL", Tremco, Inc.
5) "Sikaflex-2C SL", Sika Corporation.

b. Sealant for Vertical and Cove joints:

1) "Iso-Flex 881/830", LymTal International Inc.
2) "Dymeric 240FC", Tremco, Inc.
3) "Sikaflex-2C NS", Sika Corporation.
4) "Dynatrol II", Pecora Corporation.
5) "MasterSeal NP 2", BASF Building Systems.

4. Apply Sealant System to all joints as noted on Drawings

E. Structural Expansion Joint Sealing Systems:

1. The expansion joint sealing system shall be a complete system of compatible materials designed to produce waterproof, traffic bearing expansion joint seals as detailed on Drawings.

   a. Nosing, traffic plates, blockout fillers, bond breakers, primers and miscellaneous materials required for installation shall be recommended by the system manufacturer.

2. Ribbed Extruded Elastomeric Expansion Joint System.

   a. The following extruded elastomeric seal systems are used singularly or in combination as detailed on the drawings and are approved for usage under this section:

      1) "Thermaflex TCR Series Expansion Joint Sealing System", Emseal Corporation.
      2) "ZB Series Expansion Joint System", C/S Group.
      3) "MM LokCrete Membrane System", MM Systems Corporation.
      4) "Iso-Flex J Series Winged Expansion Joint System", LymTal International, Inc.
      5) "Wabo ME Series Expansion Joint System", Watson Bowman Acme, BASF The Chemical Company.
      6) "CS Series Chambered Seal System", Balco, Inc.
      7) "Polycrete CR Series Membrane System", Erie Metal Specialties.
      8) "Vulkem WF Series Vehicular Expansion Joints", Tremco, Inc.

   b. Approved extruded elastomeric expansion joint sealing systems shall meet the following requirements:

      1) The expansion joint seal shall be heavy-duty, impact absorbing extruded rubber membrane gland with ribbed and perforated flanges capable of resisting heavy duty traffic.
      2) The exposed surface shall be non-metallic, slip/skid resistant and resistant to ultra-violet rays and chemicals.
      3) Seal gland shall be heat weldable to ensure continuity of seal throughout.
      4) The polyurethane elastomeric concrete nosing shall be reinforced with compatible aggregates for compressive strength and abrasion-resistance while preserving its flexibility during joint movements.
      5) The elastomeric gland shall be fully embedded in the concrete nosing thereby encapsulating the perforated flanges and creating watertight seal throughout.
      6) Joint Seal Directional Changes - At all changes in direction provide seals with factory heat welded splices such as 90° corners, tees and crosses. The seal shall extend a minimum of 2’-0” in each direction from the factory splice. Only straight, butt splice connections shall be allowed on the jobsite following manufacturers written instructions. All factory and field fused connections shall incorporate bonding of the

complete seal profile. This includes fusing of all internal and external web configurations.

c. Use ribbed extruded elastomeric expansion joint system at the transition joint between slab-on-grade and structural slab at the ground tier and as shown on the Drawings.

2.3 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance, select from the following types:

1. Type C (closed-cell material with a surface skin).

C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.

D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.4 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 GENERAL

A. All work shall be installed in strict accordance with system manufacturer's recommendations employing trained installers utilizing proper tools and equipment and working under the direct supervision of a technically competent and experienced supervisor. An authorized technical representative shall attend a pre-installation conference, be present for the first day of installation and provide a minimum of three field inspection reports to the Architect during the duration of the installation.

B. All surfaces related to work under this section shall be inspected by the applicator prior to commencing work. Any conditions discovered which render the substrate unsuitable shall be reported and satisfactorily corrected prior to installation of the specified system.

C. Coordinate and verify that related work items meet the following requirements:

1. All surfaces shall be clean, dry and of sound substrate at time of application. Surfaces shall be provided free of voids, ridges and sharp projections.
2. Concrete surface finishes shall be subject to approval of the applicator.
3. Concrete surfaces shall be water cured or cured with a compatible curing compound as recommended by the manufacturer.
4. Concrete surfaces shall have cured for an acceptable period as recommended by the system manufacturer for the various components of the applicable system.

D. Environmental Conditions:

1. System application shall be at temperatures as recommended by the system manufacturer.
2. The deck surface shall be dry at time of application according to ASTM D4263, Standard Test Method for Indicating Moisture in Concrete.
3. Provide adequate ventilation in accordance with system manufacturer's recommendations during installation of the deck waterproofing system.

E. Protect all work areas from traffic until fully cured.

3.2 EXAMINATION

A. Examine joints indicated to receive waterproofing system, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting product performance.

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

3.3 PROTECTIVE CONCRETE SEALER SYSTEM

A. Clean surfaces to be treated in accordance with the system manufacturer's recommendations. Acceptable methods include sweeping, blowing, vacuuming, pressure washing, water blasting,

acid etching, sand blasting, or shot blasting as required to remove all laitance and surface contaminants to insure proper penetration and/or adhesion of the sealer.

B. Seal all joints prior to general surface treatment.

C. Select and install a test section prior to general application to verify installation procedures, application rates, adhesion, penetration and condition of the finished surface.

D. Concrete sealer shall be applied in accordance with system manufacturer's recommendation at the same rates and solids contents as tested against the criteria established in NCHRP 244.

E. Materials shall be applied by pressure sprayer, spray bar or roller.

F. Application rate shall be 125 sq. ft. per gallon for a 40% silane sealer.

G. Unsatisfactory results rejected under Section 1.4.E shall be grounds for rejection of sealer and sealer application or sealer reapplication using an approved product shall be completed at no additional cost to the Owner.

H. Sealer shall not be applied until concrete has fully cured but no earlier than 14 days after concrete has been poured. Striping shall not be placed until full cure of concrete sealer (generally, 14 days @ 70 degrees or higher) or bituminous pavement (generally, 30 days @ 45 degrees or higher) has been obtained.

3.4 ELASTOMERIC TRAFFIC DECK COATING SYSTEM

A. All traffic deck coatings are to be applied to acceptable clean, dry, sound substrates. Clean surfaces to be treated in accordance with the system manufacturer's recommendations. Acceptable methods include sweeping, blowing, vacuuming, pressure washing, water blasting, acid etching, sand blasting, or shot blasting as required to remove all laitance and surface contaminants to insure proper adhesion of the deck coating.

B. Select and install a test area prior to general application to establish procedures, verify adhesion, slip resistance, and acceptable appearance.

C. Surface preparation shall produce a surface profile matching CSP 4, 5 or 6 per ICRI 03732, as required to meet the requirements of the selected deck coating. Sweep and vacuum roughened surface to remove debris followed by low-pressure water cleaning. Coordinate surface preparation with the surface preparation for the corrosion-inhibiting treatment and vapor drive coating, as applicable.

D. Notify Architect 7 days prior to completion of the surface preparation. Meet with the Architect and manufacturer’s representative to review surface preparation, joint preparation, adhesion test results, and crack preparation, as applicable. All joint and crack preparation shall be included in the cost of the traffic deck coating system.

1. Seal all underlying control and construction joints.
2. Cracks grater than 1/16”

a. All static cracks shall be routed (V-groove) and gravity fed with a polymer sealer. Fill cracks with oven-dried sand before applying the polymer sealer per the manufacturer's requirements. After application of the polymer sealer, broadcast dry silica sand to refusal evenly over the crack.
b. All dynamic cracks shall be routed (U-groove) and receive bond breaker and sealant as detailed.

3. Detail all joints and cracks, including cracks less than 1/16", with liquid flashing a distance of 3" on each side of the joint/crack to yield a total thickness of 30 dry mils. All dynamic cracks and joints, cracks and joints 1" and wider, and all precast double tee joints shall receive reinforcing fabric embedded in the liquid flashing detail strip. The reinforcing fabric shall be compatible with the selected deck coating system and shall prevent the deck coating system from cracking due to thermal and dynamic movement of the crack or joint. However, the reinforced detail strip is not expected to prevent cracking of the deck coating system if there are structural deficiencies that causes excessive movement, such as broken double tee connections.

E. Other detailing work including sealing around drains, penetrations, curb, column and wall bases, etc., shall be accomplished in accordance with system manufacturer's recommendations prior to general application.

F. Provide a grid system marked on the deck surface to designate the area for which a container of material must be used evenly applied to obtain the desired average dry mil film thickness. A wet mil gauge shall also be used to randomly verify that mil thickness at application is consistent with system manufacturer's recommendations.

G. Broadcast clean, dry aggregate into wear coats and mix slip resistant powder into seal coat as needed to meet slip resistance requirements.

H. Application shall be by squeegee, roller and power sprayer.

I. Install the Elastomeric Traffic Deck Coatings in accordance with a "wear-rated" heavy and medium duty system per Section 2.2.C.

3.5 SLAB AND DECK CONTROL JOINT SEALANT SYSTEM

A. All sealants are to be applied to clean, dry, sound substrates. Follow system manufacturer's recommendations for cleaning and preparation of joints. Tooled control joints provided by the Goldblatt Groover #06-314-M7 shall be prepared by grinding with V- shaped wheel prior to sealing.

B. Select and install a test section prior to general application to verify adhesion and acceptable appearance.

C. Backer rods, bond breakers and primers shall be used in accordance with system manufacturer's recommendations.

D. Care shall be taken to completely fill joints without overflowing the joint or smearing adjacent surfaces.

E. Exposed joints shall be filled with sealant and tooled to a slightly recessed configuration to avoid direct contact with wheel traffic.

F. Sealant shall not be applied until after concrete curing procedures has been completed (normally at least 7 days after concrete has been poured).

3.6 STRUCTURAL EXPANSION JOINT SEALING SYSTEM

A. General:

1. Submit product data of expansion joint system to be used.
2. Coordinate expansion joint system with other related work before installation of such work.
3. Provide 6-inch vertical return upwards at column or wall termination as applicable.

B. Installation of the Ribbed and Perforated Elastomeric Expansion Joint System.

1. Provide blockouts in the concrete surface, of sufficient width and depth to receive the specified system, to be formed at the expansion joint by the concrete contractor.
2. Layout the extruded gland at maximum length possible and set the gap dimension according to the manufacturer's recommended installation temperature. Embed glands fully in the polymeric concrete nosing including perforations.
3. Fill concrete blockouts with approved polymeric nosing material flush to the top of the extruded gland and the driving surface.
4. Install secondary seal where applicable.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform the field tests and inspections.

B. Joint Sealant Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test mockups and completed elastomeric sealant joints as follows:

a. Perform 2 tests for each mockup.
b. Perform 10 tests for the first 1000 feet of joint length for each type of elastomeric sealant and joint substrate.
c. Perform 1 test for each 1000 feet of joint length thereafter or 1 test per each floor.

2. Test Method: ASTM C 1193, Appendix X1.1.

a. As appropriate for type of joint-sealant application indicated, test joint sealants according to one of the following:

1) Method A, Field-Applied Sealant Joint Hand Pull Tab
2) Method B, Exposed Surface Finish Hand Pull Tab
3) Method C, Field-Applied Sealant Joint Hand Pull Flap

4) Method D, Water Immersion.

b. For joints with dissimilar substrates, verify adhesion to each substrate separately; do this by extending cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field-adhesion-test log.
4. Inspect tested joints and report on the following:

a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
b. Whether sealants filled joint cavities and are free of voids.
c. Whether sealant dimensions and configurations comply with specified requirements.

5. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
6. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

C. Deck Coating Field-Adhesion Testing: Field test deck coating adhesion to substrates as follows:

1. Extent of Testing: Test mockups and completed deck coatings as follows:

a. Perform 2 tests for each mockup.
b. Perform 6 tests for the first 10,000 square feet of deck coating for each type of deck coating and substrate.
c. Perform 1 test for each 10,000 square feet of deck coating thereafter, but not less than 1 test per floor.

2. Test Method: ASTM D7234.

3. Inspect deck coating for bubbles, voids, aggregate distribution, and for application complying with specified requirements. Record results in a field-adhesion-test log.

4. Inspect deck coating preparation, installation, and testing. Record results in a log and report on the following:

a. Dates when surface preparation was performed.
b. Type of surface preparation.
c. If surface contaminants such as engine oil were present on the slab prior to surface preparation and cleaning.
d. If surface contaminants remain on the slab after surface preparation and cleaning.
e. Relative humidity of the slabs prior to application of deck coatings.

f. Time, date, temperature, precipitation, relative humidity, and sun exposure when deck coatings were installed. Note if conditions changed during the installation.
g. Type of materials used for deck coating installation and wait times between each application.
h. Deck coating dry mil thickness and if the thickness complies with specified requirements.
i. Test dates, test locations, and adhesion results (whether deck coating failed to adhere to substrates or tore cohesively).
j. Names of persons who performed surface preparation, who performed relative humidity testing, who installed deck coatings, and who performed adhesion tests.

5. Repair deck coatings pulled from test area by applying new deck coating following same procedures used originally. Ensure that original surfaces are clean and that new deck coating overlaps original deck coating.

D. Deck Coating Field Slip Resistance Testing: Field test deck coating slip resistance as follows:

1. Extent of Testing: Test mockups and completed deck coatings as follows:

a. Perform 2 tests for each mockup.
b. Perform 6 tests for the first 10,000 square feet of deck coating for each type of deck coating.
c. Perform 1 test for each 10,000 square feet of deck coating thereafter, but not less than 1 test per floor.

2. Test Method:

a. ANSI/NFSI B101.1 - Test Method for Measuring Wet Static Coefficient of Friction (SCOF) of Common Hard-Surface Floor Materials

3. Inspect deck coating for variations in aggregate distribution. Locate tests at areas with high density of aggregate and with low density of aggregate. Record results in a log and report on the following:

a. Test method, test dates, test locations, and slip resistance results.
b. Names of person who performed tests.
c. Type of deck coating and aggregate.
d. Application rates of deck coating system components.
e. Approximate area (square feet) of deck coating that exhibits a low density of aggregate, an average density of aggregate, and a high density of aggregate.

4. Repair deck coating test area, if damaged during testing, by applying new deck coating following same procedures used originally. Ensure that original surfaces are clean and that new deck coating overlaps original deck coating.

E. Expansion Joint Nosing Material Field-Adhesion Testing: Field test nosing material adhesion to substrates as follows:

1. Extent of Testing: Test mockups as follows:

a. Perform 2 tests for each mockup.

2. Test Method: ASTM D7234.

3. Inspect nosing material preparation, installation, and testing. Record results in a log and report on the following:

   a. Dates when surface preparation was performed.
   b. Type of surface preparation.
   c. If surface contaminants such as engine oil were present on the slab prior to surface preparation and cleaning.
   d. If surface contaminants remain on the slab after surface preparation and cleaning.
   e. Relative humidity of the slabs prior to application of nosing material.
   f. Time, date, temperature, precipitation, relative humidity, and sun exposure when expansion joints were installed. Note if conditions changed during the installation.
   g. Type of materials used for nosing material installation and wait times between each application.
   h. Test dates, test locations, and adhesion results (whether nosing material failed to adhere to substrates or tore cohesively).
   i. Names of persons who performed surface preparation, who performed relative humidity testing, who installed nosing material, and who performed adhesion tests.

4. Remove nosing material mockup after testing and prepare the substrate for installation of the expansion joint. Repair the substrate if necessary.

F. Evaluation of Field Test Results: Products not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove products that fail to adhere to substrates during testing or to comply with other requirements. Reapply mockups and retest until test results prove products comply with indicated requirements. Do not use products that fail to adhere to substrates during testing.

3.8 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.9 PROTECTION

A. Protect waterproofing systems during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so systems are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated products immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 079020

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silicone joint sealants. (Not limited to Windows, doors, tile,)
2. Nonstaining silicone joint sealants. (Not limited to Curtainwall,)
3. Urethane joint sealants. (Not limited to precast concrete blocks, aluminum HVAC pipes)
4. Silane-modified polymer joint sealants. (Not limited to Flexible, High-strength sealing)
5. Polysulfide joint sealants. (Not limited to Precast Concrete)
6. Butyl joint sealants. (Not limited to Roofing)
7. Latex joint sealants. (Not limited to Concrete paving, seismic movement)

B. Related Requirements:

1. Section 079100 "Preformed Joint Seals" for preformed compressible foam and precured joint seals.
2. Section 321373 "Concrete Paving Joint Sealants" for sealing joints in paved roads, parking lots, walkways, and curbing.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Silicone joint sealants.
2. Nonstaining silicone joint sealants.
3. Urethane joint sealants.
4. Silane-modified polymer joint sealants.
5. Polysulfide joint sealants.
6. Butyl joint sealants.
7. Latex joint sealants.

B. Samples for Initial Selection: Manufacturer's standard color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.3 INFORMATIONAL SUBMITTALS

A. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:

1. Joint-sealant location and designation.
2. Manufacturer and product name.
3. Type of substrate material.
4. Proposed test.
5. Number of samples required.

B. Preconstruction Laboratory Test Reports: For each joint sealant and substrate material to be tested from sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.

C. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

D. Field Quality-Control Reports: For field-adhesion-test reports, for each sealant application tested.

E. Sample warranties.

1.4 CLOSEOUT SUBMITTALS

A. Manufacturers' special warranties.

B. Installer's special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Authorized representative who is trained and approved by manufacturer.

B. Testing Agency Qualifications: Qualified in accordance with ASTM C1021 to conduct the testing indicated.

1.6 MOCKUPS

A. Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Adhesion Testing: Use ASTM C794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Compatibility Testing: Use ASTM C1087 to determine sealant compatibility when in contact with glazing and gasket materials.
3. Stain Testing: Use ASTM C1248 to determine stain potential of sealant when in contact with stone masonry substrates.
4. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.
5. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
6. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
7. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
2. Conduct field tests for each kind of sealant and joint substrate.
3. Notify Architect seven days in advance of dates and times when test joints will be erected.
4. Test Method: Test joint sealants in accordance with Method A, Tail Procedure, in ASTM C1521.

    a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.8 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.

3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.9 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: Five years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain joint sealants from single manufacturer for each sealant type.

2.2 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 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. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Sika
b. W. R. Meadows
c. 3M
d. The Dow Chemical Company
e. Or Approved Equal.

2.

B. Silicone, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Sika
b. W. R. Meadows
c. 3M
d. The Dow Chemical Company
e. Or Approved Equal.

C. Silicone, S, NS, 35, NT: Single-component, nonsag, plus 35 percent and minus 35 percent movement capability. nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 35, Use NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Sika
b. W. R. Meadows
c. 3M
d. The Dow Chemical Company
e. Or Approved Equal.

D. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Sika
    b. W. R. Meadows
    c. 3M
    d. The Dow Chemical Company
    e. Or Approved Equal.

E. Silicone, Acid Curing, S, NS, 25, NT: 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. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Sika
    b. W. R. Meadows
    c. 3M
    d. The Dow Chemical Company
    e. Or Approved Equal.

F. Silicone, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Sika
    b. W. R. Meadows
    c. 3M
    d. The Dow Chemical Company
    e. Or Approved Equal.

G. Silicone, S, NS, 50, T, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Sika
    b. W. R. Meadows
    c. 3M
    d. The Dow Chemical Company
    e. Or Approved Equal.

H. Silicone, S, NS, 25, T, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Sika
b. W. R. Meadows
c. 3M
d. The Dow Chemical Company
e. Or Approved Equal.

I. Silicone, S, P, 100/50, T, NT: Single-component, pourable, plus 100 percent and minus 50 percent movement capability traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade P, Class 100/50, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Sika
b. W. R. Meadows
c. 3M
d. The Dow Chemical Company
e. Or Approved Equal.

J. Silicone, M, P, 100/50, T, NT: Multicomponent, pourable, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type M, Grade P, Class 100/50, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Sika
b. W. R. Meadows
c. 3M
d. The Dow Chemical Company
e. Or Approved Equal.

2.4 NONSTAINING SILICONE JOINT SEALANTS

A. Nonstaining Joint Sealants: No staining of substrates when tested in accordance with ASTM C1248.

B. Silicone, Nonstaining, S, NS, 100/50, NT: Nonstaining, 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. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Sika
    b. W. R. Meadows
    c. 3M
    d. The Dow Chemical Company
    e. Or Approved Equal.

C. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Sika
    b. W. R. Meadows
    c. 3M
    d. The Dow Chemical Company
    e. Or Approved Equal.

D. Silicone, Nonstaining, S, NS, 100/50, T, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Sika
    b. W. R. Meadows
    c. 3M
    d. The Dow Chemical Company
    e. Or Approved Equal.

E. Silicone, Nonstaining, M, NS, 50, NT: Nonstaining, multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type M, Grade NS, Class 50, Use NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Sika
    b. W. R. Meadows
    c. 3M
    d. The Dow Chemical Company
    e. Or Approved Equal.

2.5 URETHANE JOINT SEALANTS

A. Urethane, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Sika
b. W. R. Meadows
c. 3M
d. The Dow Chemical Company
e. Or Approved Equal.

B. Urethane, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Sika
b. W. R. Meadows
c. 3M
d. The Dow Chemical Company
e. Or Approved Equal.

C. Urethane, S, NS, 25, T, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 25, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Sika
b. W. R. Meadows
c. 3M
d. The Dow Chemical Company
e. Or Approved Equal.

D. Urethane, S, P, 35, T, NT: Single-component, pourable, plus 35 percent and minus 35 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade P, Class 35, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Sika
b. W. R. Meadows
c. 3M
d. The Dow Chemical Company
e. Or Approved Equal.

E. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade P, Class 25, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Sika
b. W. R. Meadows
c. 3M
d. The Dow Chemical Company
e. Or Approved Equal.

F. Urethane, M, NS, 50, NT: Multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade NS, Class 50, Use NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Sika
b. W. R. Meadows
c. 3M
d. The Dow Chemical Company
e. Or Approved Equal.

G. Urethane, M, NS, 25, NT: Multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade NS, Class 25, Use NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Sika
b. W. R. Meadows
c. 3M
d. The Dow Chemical Company
e. Or Approved Equal.

H. Urethane, M, NS, 50, T, NT: Multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade NS, Class 50, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Sika
    b. W. R. Meadows
    c. 3M
    d. The Dow Chemical Company
    e. Or Approved Equal.

I. Urethane, M, NS, 25, T, NT: Multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade NS, Class 25, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Sika
    b. W. R. Meadows
    c. 3M
    d. The Dow Chemical Company
    e. Or Approved Equal.

J. Urethane, M, P, 50, T, NT: Multicomponent, pourable, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade P, Class 50, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Sika
    b. W. R. Meadows
    c. 3M
    d. The Dow Chemical Company
    e. Or Approved Equal.

K. Urethane, M, P, 25, T, NT: Multicomponent, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade P, Class 25, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Sika
    b. W. R. Meadows
    c. 3M
    d. The Dow Chemical Company
    e. Or Approved Equal.

2.6 SILANE-MODIFIED POLYMER JOINT SEALANTS

A. Silane-Modified Polymer, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, [**silyl-terminated polyether**] [**silyl-terminated polyurethane**] [**polyurea**] joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Sika
b. W. R. Meadows
c. 3M
d. The Dow Chemical Company
e. Or Approved Equal.

B. Silane-Modified Polymer, S, NS, 35, NT: Single-component, nonsag, plus 35 percent and minus 35 percent movement capability, nontraffic-use, [**silyl-terminated polyether**] [**silyl-terminated polyurethane**] [**polyurea**] joint sealant; ASTM C920, Type S, Grade NS, Class 35, Use NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Sika
b. W. R. Meadows
c. 3M
d. The Dow Chemical Company
e. Or Approved Equal.

C. Silane-Modified Polymer, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, [**silyl-terminated polyether**] [**silyl-terminated polyurethane**] [**polyurea**] joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Sika
b. W. R. Meadows
c. 3M
d. The Dow Chemical Company
e. Or Approved Equal.

D. Silane-Modified Polymer, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, [**silyl-terminated polyether**] [**silyl-terminated polyurethane**] [**polyurea**] joint sealant; ASTM C920, Type S, Grade NS, Class 100, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Sika
    b. W. R. Meadows
    c. 3M
    d. The Dow Chemical Company
    e. Or Approved Equal.

E. Silane-Modified Polymer, S, NS, 50, T, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, [**silyl-terminated polyether**] [**silyl-terminated polyurethane**] [**polyurea**] joint sealant; ASTM C920, Type S, Grade NS, Class 50, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Sika
    b. W. R. Meadows
    c. 3M
    d. The Dow Chemical Company
    e. Or Approved Equal.

F. Silane-Modified Polymer, S, NS, 35, T, NT: Single-component, nonsag, plus 35 percent and minus 35 percent movement capability, traffic- and nontraffic-use, [**silyl-terminated polyether**] [**silyl-terminated polyurethane**] [**polyurea**] joint sealant; ASTM C920, Type S, Grade NS, Class 35, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Sika
    b. W. R. Meadows
    c. 3M
    d. The Dow Chemical Company
    e. Or Approved Equal.

G. Silane-Modified Polymer, S, NS, 25, T, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, [**silyl-terminated polyether**] [**silyl-terminated polyurethane**] [**polyurea**] joint sealant; ASTM C920, Type S, Grade NS, Class 25, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Sika
    b. W. R. Meadows

c. 3M
d. The Dow Chemical Company
e. Or Approved Equal.

H. Silane-Modified Polymer, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, [**silyl-terminated polyether**] [**silyl-terminated polyurethane**] [**polyurea**] joint sealant; ASTM C920, Type S, Grade P, Class 25, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Sika
b. W. R. Meadows
c. 3M
d. The Dow Chemical Company
e. Or Approved Equal.

2.7 POLYSULFIDE JOINT SEALANTS

A. Polysulfide, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, polysulfide joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Sika
b. W. R. Meadows
c. 3M
d. The Dow Chemical Company
e. Or Approved Equal.

B. Polysulfide, M, NS, 25, T, NT: Multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, polysulfide joint sealant; ASTM C920, Type M, Grade NS, Class 25, Use NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Sika
b. W. R. Meadows
c. 3M
d. The Dow Chemical Company
e. Or Approved Equal.

C. Polysulfide, M, P, 25, T, NT: Multicomponent, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, polysulfide joint sealant; ASTM C920, Type M, Grade P, Class 25, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Sika
b. W. R. Meadows
c. 3M
d. The Dow Chemical Company
e. Or Approved Equal.

2.8 BUTYL JOINT SEALANTS

A. Butyl-Rubber-Based Joint Sealants: ASTM C1311.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Sika
b. W. R. Meadows
c. 3M
d. The Dow Chemical Company
e. Or Approved Equal.

2.9 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Sika
b. W. R. Meadows
c. 3M
d. The Dow Chemical Company
e. Or Approved Equal.

2.10 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Sika
    b. W. R. Meadows
    c. 3M
    d. The Dow Chemical Company
    e. Or Approved Equal.

B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin) Type O (open-cell material) Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.11 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.
    c. Unglazed surfaces of ceramic tile.
    d. Exterior insulation and finish systems.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.
    c. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants in accordance with requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile in accordance with Figure 8A in ASTM C1193 unless otherwise indicated.
4. Provide recessed joint configuration of recess depth and at locations indicated on Drawings in accordance with Figure 8C in ASTM C1193.

    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

    a. Extent of Testing: Test completed and cured sealant joints as follows:

        1) Perform 10 tests for the first 1000 ft. of joint length for each kind of sealant and joint substrate.

    b. Test Method: Test joint sealants in accordance with Method A, Tail Procedure, in ASTM C1521.

        1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

    c. Inspect tested joints and report on the following:

        1) Whether sealants filled joint cavities and are free of voids.
        2) Whether sealant dimensions and configurations comply with specified requirements.

3) Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.

d. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.

e. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

2. 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.

C. Prepare test and inspection reports.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior standard steel doors and frames.
2. Exterior standard steel doors and frames.

B. Related Requirements:
1. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.

1.2 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings in accordance with NAAMM-HMMA 803 or ANSI/SDI A250.8.

1.3 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data:

1. Interior standard steel doors and frames.
2. Exterior standard steel doors and frames.

B. Product Data Submittals: For each product.

1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings, and finishes.

C. Sustainable Design Submittals:

D. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
7. Details of anchorages, joints, field splices, and connections.
8. Details of accessories.

E. Product Schedule: For hollow-metal doors and 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.

1.6 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.8 QUALITY ASSURANCE

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 HOLLOW METAL DOORS AND FRAMES

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

1. Ceco Door; AADG, Inc.; ASSA ABLOY.
2. Curries, AADG, Inc.; ASSA ABLOY Group.
3. Pioneer Industries, Inc.
4. Steelcraft; Allegion plc.
5. Or Approved Equal.

2.2 PERFORMANCE REQUIREMENTS

A. Windborne-Debris Impact Resistance: Passes ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 for Wind Zone for basic protection.

2.3 INTERIOR STANDARD STEEL DOORS AND FRAMES

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 2; ANSI/SDI A250.4, Level B..

1. Doors:

a. Type: As indicated in the Door and Frame Schedule on Drawings.
b. Thickness: 1-3/4 inches.
c. Face: Metallic-coated steel sheet, minimum thickness of 0.042 inch.
d. Edge Construction: Model 1, Full Flush.
e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
f. Core: Manufacturer's standard.
g. Fire-Rated Core: Manufacturer's standard core for fire-rateddoors.

2. Frames:

a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch.
b. Construction: Full profile welded.

3. Exposed Finish: Prime.

2.4 EXTERIOR STANDARD STEEL DOORS AND FRAMES

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Extra-Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 3; ANSI/SDI A250.4, Level A..

1. Doors:

a. Type: As indicated in the Door and Frame Schedule on Drawings.
b. Thickness: 1-3/4 inches.
c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A60 coating.
d. Edge Construction: Model 1, Full Flush.
e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
f. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
g. Bottom Edges: Close bottom edges of doors with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
h. Core: Polystyrene, Polyurethane or Polyisocyanurate insulation.
i. Fire-Rated Core: Manufacturer's standard core for fire-rated doors.

2. Frames:

a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A60 coating.
b. Construction: Full profile welded.

3. Exposed Finish: Prime.

2.5 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 of frame height above 7 feet.
3. Postinstalled Expansion Anchor: Minimum 3/8-inch-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. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z 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 in accordance with ASTM A153/A153M, Class B.

2.6 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized in accordance with ASTM A153/A153M.

E. 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.

F. 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.

G. Glazing: Comply with requirements in Section 088000 "Glazing."

2.7 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 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. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
   2. 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 doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping in accordance with ANSI/SDI A250.6, the Door Hardware Schedule on Drawings, and templates.

   1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
   2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.

2.8 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. Field Finish: Finish paint as specified in section 099600

2.9 LOUVERS

A. Provide louvers for interior doors, where indicated, which comply with SDI 111, with blades or baffles formed of 0.020-inch-thick, cold-rolled steel sheet set into 0.032-inch-thick steel frame.

1. Sightproof Louver: Stationary louvers constructed with inverted-V or inverted-Y blades.
2. Lightproof Louver: Stationary louvers constructed with baffles to prevent light from passing from one side to the other.
3. Fire-Rated Automatic Louvers: Louvers constructed with movable blades closed by actuating fusible link, and listed and labeled for use in fire-rated door assemblies of type and fire-resistance rating indicated by same qualified testing and inspecting agency that established fire-resistance rating of door assembly.

B. Form corners of moldings with hairline joints. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.

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 doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

A. Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.

B. 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 in accordance with NFPA 80.
3. Floor Anchors: Secure with postinstalled expansion anchors.

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 postinstalled 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, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.

1. Non-Fire-Rated Steel Doors: Comply with ANSI/SDI A250.8.
2. Fire-Rated Doors: Install doors with clearances in accordance with NFPA 80.
3. Smoke-Control Doors: Install doors in accordance with NFPA 105.

D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.

B. Inspections:

1. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.

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.

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 in accordance with manufacturer's written instructions.

C. Factory-Finish Touchup: Clean abraded areas and repair with same material used for factory finish in accordance with manufacturer's written instructions.

D. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aluminum-framed entrance and storefront systems.

B. Related Requirements:
1. Section 034000 “Precast Concrete”
2. Section 076200 “Sheet Metal Flashing and Trim”.
3. Section 079200 “Joint Sealants”
4. Section 088000 "Glazing" for aluminum-framed entrances and storefront glazing.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Aluminum-framed entrance and storefront systems.

B. Product Data Submittals: For each product.

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Operating characteristics, electrical characteristics, and furnished accessories.

C. Shop Drawings:

1. Plans, elevations, sections, full-size details, and attachments to other work.
2. Details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
3. Full-size isometric details of each type of vertical-to-horizontal intersection of aluminum-framed entrance and storefront systems, showing the following:

    a. Joinery, including concealed welds.
    b. Anchorage.
    c. Expansion provisions.
    d. Glazing.
    e. Flashing and drainage.

4. Connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
5. Point-to-point wiring diagrams showing the following:

    a. Power requirements for each electrically operated door hardware.
    b. Location and types of switches, signal device, conduit sizes, and number and size of wires.

6. Signed and sealed by the qualified professional engineer responsible for their preparation.

D. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of exposed finish.

E. Samples for Verification: Actual sample of finished products for each type of exposed finish.

1. Size: Manufacturers' standard size.

F. 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. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

G. Delegated Design Submittals: For aluminum-framed entrances and storefront systems, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Energy Performance Certificates: For aluminum-framed entrance and storefront systems, accessories, and components, from manufacturer.

1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront system.

B. Product Test Reports: For aluminum-framed entrance and storefront systems, for tests performed by a qualified testing agency.

C. Source Quality-Control Reports: For aluminum-framed entrance and storefront systems.

D. Qualification Statements:

1. For Installer.

E. Delegated Design Engineer Qualifications: For aluminum-framed entrance and storefront systems.

F. Sample Warranties: For aluminum-framed entrance and storefront systems.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For aluminum-framed entrance and storefront systems.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:
1. Entity that employs installers and supervisors who are trained and approved by manufacturer for both the installation and maintenance of units required for this Project.

B. Delegated Design Engineer Qualifications: A professional engineer who is legally qualified to practice in New York where Project is located and who is experienced in providing engineering services of the type indicated.

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.

1.6 MOCKUPS

A. Build mockups to verify selections made under Sample submittals to demonstrate aesthetic effects to set quality standards for fabrication and installation.
1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 WARRANTY

A. Special Warranty: Manufacturer and Installer agree to repair or replace components of aluminum-framed entrance and storefront systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures..
b. Faulty operation.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
d. Water penetration through fixed openings and framing areas.

2. 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 factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.

c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: 20 years 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. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested in accordance with ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D 4214.
c. Cracking, peeling, or chipping.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain all components of aluminum-framed entrance and storefront system, including framing spandrel panels venting windows and accessories, from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed entrance and storefront systems.

B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrance and storefront systems representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrance and storefront systems to 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.

2. Other Design Loads: As indicated on Drawings.

D. Deflection of Framing Members Supporting Glass: At design wind load, as follows:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans of up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches.
2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch.

    a. Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.

3. Cantilever Deflection: Limited to 2L/175 at unsupported cantilevers.

E. Structural: Test in accordance with 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 exceeding specified limits.
2. When tested at 150 percent 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 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Water Penetration under Static Pressure: Test in accordance with ASTM E331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested in accordance with a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft..

G. Seismic Performance: Aluminum-framed entrance and storefront systems to withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7 and applicable Building Code.

H. 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 0.69 Btu/sq. ft. x h x deg F as determined in accordance with NFRC 100.
    b. Entrance Doors: U-factor of not more than 0.68 Btu/sq. ft. x h x deg F as determined in accordance with NFRC 100.

2. Solar Heat-Gain Coefficient (SHGC):

    a. Fixed Glazing and Framing Areas: SHGC for the system of not more than 0.40 as determined in accordance with NFRC 200.

b. Entrance Doors: SHGC of not more than 0.40 as determined in accordance with 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. at a static-air-pressure differential of 6.24 lbf/sq. ft. when tested in accordance with ASTM E283.
b. Entrance Doors: Air leakage of not more than 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..

4. Condensation Resistance Factor (CRF):

a. Fixed Glazing and Framing Areas: CRF for the system of not less than 55 as determined in accordance with AAMA 1503.
b. Entrance Doors: CRF of not less than 63 as determined in accordance with AAMA 1503.

I. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.3 ALUMINUM-FRAMED ENTRANCE AND STOREFRONT SYSTEMS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. EFCO Corporation.
2. Kawneer Company, Inc.; Arconic Corporation.
3. Old Castle Building Envelope (OBE).
4. YKK AP America Inc.
5. Or Approved Equal.

B. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Exterior Framing Construction: Thermally broken.
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: Center.
4. Finish: Clear anodic 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.

E. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing or automatic operation.

1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch- 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.

2. Door Design: Medium stile; 3-1/2-inch nominal width.
3. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.

4. Finish: Match adjacent storefront framing finish.

2.4 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 087100 "Door Hardware."

B. General: Provide entrance door hardware and entrance door hardware sets indicated in door and frame schedule for each entrance door, to comply with requirements in this Section.

1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products equivalent in function and comparable in quality to named products.
2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
3. Opening-Force Requirements:

a. Egress Doors: Not more than 15 lbf to release the latch and not more than 30 lbf to set the door in motion and not more than 15 lbf to open the door to its minimum required width.
b. Accessible Interior Doors: Not more than 5 lbf to fully open door.

C. Designations: Requirements for design, grade, function, finish, quantity, size, and other distinctive qualities of each type of entrance door hardware are indicated in "Entrance Door Hardware Sets" Article. Products are identified by using entrance door hardware designations as follows:

1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in "Entrance Door Hardware Sets" Article.
2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.

D. Pivot Hinges: BHMA A156.4, Grade 1.

1. Offset-Pivot Hinges: Provide top, bottom, and intermediate offset pivots at each door leaf.

E. Butt Hinges: BHMA A156.1, Grade 1, radius corner.

1. Nonremovable Pins: Provide setscrew in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while entrance door is closed.
2. Exterior Hinges: Stainless steel, with stainless steel pin.
3. Quantities:

a. For doors up to 87 inches high, provide three hinges per leaf.
b. For doors more than 87 and up to 120 inches high, provide four hinges per leaf.

F. Continuous-Gear Hinges: BHMA A156.26.

G. Mortise Auxiliary Locks: BHMA A156.5, Grade 1.

H. Manual Flush Bolts: BHMA A156.16, Grade 1.

I. Automatic and Self-Latching Flush Bolts: BHMA A156.3, Grade 1.

J. Panic Exit Devices: BHMA A156.3, Grade 1, listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing in accordance with UL 305.

K. Cylinders:

1. As specified in Section 087100 "Door Hardware."
2. BHMA A156.5, Grade 1.

a. Keying: Master key system. Permanently inscribe each key with a visual key control number and include notation "DO NOT DUPLICATE" to be furnished by Owner.

L. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.

M. Operating Trim: BHMA A156.6.

N. Removable Mullions: BHMA A156.3 extruded aluminum.

1. When used with panic exit devices, provide keyed removable mullions listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing in accordance with UL 305. Use only mullions that have been tested with exit devices to be used.

O. Closers: BHMA A156.4, Grade 1, with accessories required for a complete installation, sized as required by door size, exposure to weather, and anticipated frequency of use; adjustable to comply with field conditions and requirements for opening force.

P. Concealed Overhead Holders and Stops: BHMA A156.8, Grade 1.

Q. Door Stops: BHMA A156.16, Grade 1, floor or wall mounted, as appropriate for door location indicated, with integral rubber bumper.

R. Weather Stripping: Manufacturer's standard replaceable components.

1. Compression Type: Made of ASTM D2000 molded neoprene or ASTM D2287 molded PVC.
2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

S. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

T. Thresholds: BHMA A156.21 raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch.

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.

D. Weatherseal Sealants: ASTM C920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed storefront manufacturers for this use.

1. Color: Match structural sealant.

2.6 MATERIALS

A. Sheet and Plate: ASTM B209.

B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.

C. Structural Profiles: ASTM B308/B308M.

D. 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.

E. 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 in accordance with recommendations in SSPC-SP COM, and prepare surfaces in accordance with applicable SSPC standard.

2.7 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123/A123M or ASTM A153/A153M requirements.

C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

D. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil thickness per coat.

E. Rigid PVC filler.

2.8 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. 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 exterior.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

C. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

D. Storefront Framing: Fabricate components for assembly using screw-spline system.

E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

1. At interior and exterior doors, provide compression weather stripping at fixed stops.

F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

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 in accordance with Shop Drawings.

2.9 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

B. Color Anodic Finish: AAMA 611, AA-M12C22A32/A34, Class II, 0.010 mm or thicker.

1. Color: As selected by Architect from full range of industry colors and color densities.

C. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

D. High-Performance Organic Finish, Two-Coat PVDF: Fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat.

1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Color and Gloss: As selected by Architect from manufacturer's full range.

2.10 SOURCE QUALITY CONTROL

A. Structural Sealant: Perform quality-control procedures complying with ASTM C1401 recommendations, including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

3.2 INSTALLATION OF ALUMINUM-FRAMED ENTRANCE AND STOREFRONT SYSTEMS

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.

K. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

L. 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 in accordance with entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

M. Install glazing as specified in Section 088000 "Glazing."

N. Install structural glazing as follows:

1. Prepare surfaces that will contact structural sealant in accordance with sealant manufacturer's written instructions, to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
2. Set glazing into framing in accordance with sealant manufacturer and framing manufacturer's written instructions and standard practice. Use a spacer or backer as recommended by manufacturer.

3. Set glazing with proper orientation so that coatings face exterior or interior as specified.
4. Hold glazing in place using temporary retainers of type and spacing recommended by manufacturer, until structural sealant joint has cured.
5. Apply structural sealant to completely fill cavity, in accordance with sealant manufacturer and framing manufacturer's written instructions and in compliance with local codes.
6. Apply structural sealant at temperatures indicated by sealant manufacturer for type of sealant.
7. Allow structural sealant to cure in accordance with manufacturer's written instructions.
8. Clean and protect glass as indicated in Section 088000 "Glazing."
9. After structural sealant has completely cured, remove temporary retainers and insert backer rod between lites of glass as recommended by sealant manufacturer.
10. Install weatherseal sealant to completely fill cavity, in accordance with sealant manufacturer's written instructions, to produce weatherproof joints.

3.3 ERECTION TOLERANCES

A. Install aluminum-framed entrance and storefront systems to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
3. Alignment:

    a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
    b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
    c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.

4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests.

B. Tests: Perform the following tests on representative areas of aluminum-framed entrance and storefront systems.

1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect to be tested in accordance with AAMA 501.2 and to not evidence water penetration.

    a. Perform a minimum of two tests in areas as directed by Architect.

2. Air Leakage: ASTM E783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..

a. Perform a minimum of two tests in areas as directed by Architect.

3. Water Penetration: ASTM E1105 at a minimum uniform static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft., and to not evidence water penetration.

C. Inspection Agency: Owner will engage a qualified inspector to perform inspections.

D. Inspections:

1. Egress Door Inspections: Inspect each aluminum-framed entrance door equipped with panic hardware, located in an exit enclosure, electrically controlled, and equipped with special locking arrangements, in accordance with NFPA 101, Ch. 7 "Means of Egress," Section "Means of Egress Components," Article "Inspection of Door Openings."

E. Aluminum-framed entrance and storefront systems will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

3.5 MAINTENANCE SERVICE

A. Entrance Door Hardware Maintenance:

1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.
2. Initial Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Use parts and supplies that are the same as those used in the manufacture and installation of original equipment.

END OF SECTION 084113

SECTION 084413 - GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glazed aluminum curtain wall systems:

a. Conventionally glazed.

B. Related Requirements:

1. Section 034000 ”Precast Concrete”.
2. Section 076200 “Sheet Metal Flashing and Trim”.
3. Section 079200 "Joint Sealants" for installation of joint sealants installed with glazed aluminum curtain walls and for sealants to the extent not specified in this Section.

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. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For glazed aluminum curtain walls. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Include full-size isometric details of each type of vertical-to-horizontal intersection of glazed aluminum curtain walls, showing the following:

a. Joinery, including concealed welds.
b. Anchorage.
c. Expansion provisions.
d. Glazing.
e. Flashing and drainage.

3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

D. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:

1. Joinery, including concealed welds.
2. Anchorage.
3. Expansion provisions.
4. Glazing.
5. Flashing and drainage.

E. Delegated-Design Submittal: For glazed aluminum curtain walls, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Installer.
2. For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the state in which Project is located.

B. Energy Performance Certificates: For glazed aluminum curtain walls, accessories, and components from manufacturer.

1. Basis for Certification: NFRC-certified energy performance values for each glazed aluminum curtain wall.

C. Product Test Reports: For glazed aluminum curtain walls, for tests performed by a qualified testing agency.

D. Quality-Control Program: Developed specifically for Project, including fabrication and installation, in accordance with recommendations in ASTM C1401. Include periodic quality-control reports.

E. Source quality-control reports.

F. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For glazed aluminum curtain walls to include in maintenance manuals.

B. Maintenance Data for Structural Sealant: For structural-sealant-glazed curtain walls to include in maintenance manuals. Include ASTM C1401 recommendations for post-installation-phase quality-control program.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer and that employs a qualified glazing contractor for this Project who is certified under the North American Contractor Certification Program (NACC) for Architectural Glass & Metal (AGM) contractors.

B. 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 MOCKUPS

A. Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
1. Testing shall be performed on mockups in accordance with requirements in "Field Quality Control" Article.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 WARRANTY

A. Special Assembly Warranty: Manufacturer agrees to repair or replace components of glazed aluminum curtain wall that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Noise or vibration created by wind and thermal and structural movements.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
d. Water penetration through fixed glazing and framing areas.
e. Failure of operating components.

2. 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. Deterioration includes, but is not limited to, the following:

    a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
    b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
    c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: 20 years 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. Deterioration includes, but is not limited to, the following:

    a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
    b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
    c. Cracking, peeling, or chipping.

2. Warranty Period: 10 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 glazed aluminum curtain walls.

B. General Performance: Comply with performance requirements specified, as determined by testing of glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Glazed aluminum curtain walls shall withstand movements of supporting structure, including, but not limited to, story drift, 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.
2. Other Design Loads: As indicated on Drawings.

D. Deflection of Framing Members Supporting Glass: At design wind load, as follows:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans of up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans of greater than 13 feet 6 inches.
2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch.

3. Cantilever Deflection: Limited to 2l/175 at unsupported cantilevers.

E. Structural: Test in accordance with ASTM E330/E330M as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Water Penetration under Static Pressure: Test in accordance with ASTM E331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested in accordance with a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft..

G. Interstory Drift: Accommodate design displacement of adjacent stories indicated.

1. Design Displacement: As indicated on Drawings.
2. Test Performance: Complying with criteria for passing based on building occupancy type when tested in accordance with AAMA 501.4 at design displacement and 1.5 times the design displacement.

H. Seismic Performance: Glazed aluminum curtain walls shall withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7 .

1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested in accordance with AAMA 501.6 at design displacement.
2. Vertical Interstory Movement: Complying with criteria for passing based on building occupancy type when tested in accordance with AAMA 501.7 at design displacement.

I. Energy Performance: Certified and labelled 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 0.50 Btu/sq. ft. x h x deg F as determined in accordance with NFRC 100.

2. Solar Heat Gain Coefficient (SHGC):

a. Fixed Glazing and Framing Areas: SHGC for the system of not more than 0.45 as determined in accordance with 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. at a static-air-pressure differential of 6.24 lbf/sq. ft. when tested in accordance with ASTM E283.

4. Condensation Resistance Factor (CRF):

a. Fixed Glazing and Framing Areas: CRF for the system of not less than 55 as determined in accordance with AAMA 1503.

J. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested in accordance with AAMA 501.5.

a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
b. Low Exterior Ambient-Air Temperature: 0 deg F.

2.2 SOURCE LIMITATIONS

A. Obtain all components of curtain-wall system and storefront system, including framing entrances and accessories, from single manufacturer.

2.3 GLAZED ALUMINUM CURTAIN WALL SYSTEMS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer Company, Inc.; Arconic Corporation 1620 System 2” x 6” mullion cross section:

1. EFCO Corporation.
2. Old Castle Building Envelope (OBE).
3. YKK AP America Inc.
4. Or Approved Equal.

B. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally broken.
2. Glazing Plane: Front.
3. Finish: Clear anodic finish.
4. System: Stick system.
5. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

6. Steel Reinforcement: As required by manufacturer.

C. Pressure Caps: Manufacturer's standard aluminum components that mechanically retain glazing.

1. Include snap-on aluminum trim that conceals fasteners.

D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

E. Entrance Door Systems: Comply with Section 084113 "Aluminum-Framed Entrances and Storefronts".

2.4 GLAZING

A. Glazing: Comply with Section 088000 "Glazing."

B. Glazing Gaskets: ASTM C509 or ASTM C864. Manufacturer's standard.

1. Color: Black.

C. Glazing Sealants: As recommended by manufacturer.

1. Color: As selected by Architect from manufacturer's full range of colors.

2.5 MATERIALS

A. Sheet and Plate: ASTM B209.

B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.

C. Structural Profiles: ASTM B308/B308M.

D. 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.

E. 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 in accordance with recommendations in SSPC-SP COM, and prepare surfaces in accordance with applicable SSPC standard.

2.6 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123/A123M or ASTM A153/A153M requirements.

C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

D. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil thickness per coat.

2.7 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. 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 exterior.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
7. Components curved to indicated radii.

C. Fabricate components to resist water penetration as follows:

1. Internal guttering system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
2. Pressure-equalized system or double barrier design with primary air and vapor barrier at interior side of glazed aluminum curtain wall and secondary seal weeped and vented to exterior.

D. Curtain-Wall Framing: Fabricate components for assembly using shear-block system.

E. After fabrication, clearly mark components to identify their locations in Project in accordance with Shop Drawings.

2.8 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

2.9 SOURCE QUALITY CONTROL

A. Structural Sealant: Perform quality-control procedures complying with ASTM C1401 recommendations, including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

3.2 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. Where welding is required, weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.

G. Seal joints watertight unless otherwise indicated.

H. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with primer, applying sealant or tape, or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

I. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.

J. Install components plumb and true in alignment with established lines and grades.

3.3 INSTALLATION OF GLAZING

A. Install glazing as specified in Section 088000 "Glazing."

3.4 INSTALLATION OF WEATHERSEAL SEALANT

A. After structural sealant has completely cured, remove temporary retainers and insert backer rod between lites of glass, as recommended by sealant manufacturer.

B. Install weatherseal sealant to completely fill cavity, in accordance with sealant manufacturer's written instructions, to produce weatherproof joints.

3.5 ERECTION TOLERANCES

A. Install glazed aluminum curtain walls to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
3. Alignment:

    a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
    b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
    c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.

4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Test Area: Perform tests on representative areas of glazed aluminum curtain walls.

C. Field Quality-Control Testing: Perform the following test on representative areas of glazed aluminum curtain walls.

1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested in accordance with AAMA 501.2 and shall not evidence water penetration.

    a. Perform a minimum of three tests in areas as directed by Architect.

2. Air Leakage: ASTM E783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..

    a. Perform a minimum of two tests in areas as directed by Architect.

3. Water Penetration: ASTM E1105 at a minimum uniform static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft., and shall not evidence water penetration.

D. Glazed aluminum curtain walls will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION 084413

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hinges.
2. Mortise locks.
3. Push-pull latches.
4. Mortise auxiliary locks.
5. Manual flush bolts.
6. Self-latching flush bolts.
7. Exit devices and auxiliary items.
8. Lock cylinders.
9. Key lock boxes.
10. Operating trim.
11. Coordinators.
12. Astragals.
13. Surface closers.
14. Concealed closers.
15. Closer holder release devices.
16. Wall- and floor-mounted stops.
17. Overhead stops and holders.
18. Door gasketing.
19. Thresholds.
20. Metal protective trim units.

B. Related Requirements:
1. Section 081113 "Hollow Metal Doors and Frames" for astragals provided as part of labeled fire-rated assemblies and for door silencers provided as part of hollow-metal frames.
2. Section 083323 "Overhead Coiling Doors" for door hardware provided as part of overhead coiling door assemblies.
3. Section 084113 "Aluminum-Framed Entrances and Storefronts" for entrance door hardware, including cylinders.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 80 - Fire Doors and Windows.
4. NFPA 101 - Life Safety Code.
5. State Building Codes, Local Amendments.

D. Standards: All hardware specified herein shall comply with the following industry standards:

1. ANSI/BHMA Certified Product Standards - A156 Series
2. UL10C – Positive Pressure Fire Tests of Door Assemblies

1.2 COORDINATION

A. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

B. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

C. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

1.3 PREINSTALLATION MEETINGS

A. Keying Conference: Conduct conference at Project site.

1. Conference participants must include Installer's Architectural Hardware Consultant and applicable Owner’s representative.
2. Incorporate conference decisions into keying schedule after reviewing door hardware keying system, including, but not limited to, the following:

    a. Flow of traffic and degree of security required.
    b. Preliminary key system schematic diagram.
    c. Requirements for key control system.
    d. Requirements for access control.
    e. Address for delivery of keys.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Hinges.
2. Mortise locks.
3. Push-pull latches.
4. Bored auxiliary locks.
5. Mortise auxiliary locks.
6. Manual flush bolts.
7. Self-latching flush bolts.
8. Exit devices and auxiliary items.
9. Lock cylinders.
10. Key lock boxes.
11. Operating trim.
12. Coordinators.
13. Astragals.
14. Surface closers.

15. Concealed closers.
16. Closer holder release devices.
17. Wall- and floor-mounted stops.
18. Overhead stops and holders.
19. Door gasketing.
20. Thresholds.
21. Metal protective trim units.
22. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Product Data Submittals: For each product.

C. Samples: For each exposed product in each finish specified, in manufacturer's standard size.

1. Tag Samples with full product description to coordinate Samples with door hardware schedule.

D. Samples for Initial Selection: For each type of exposed finish.

E. Samples for Verification: For each type of exposed product, in each finish specified.

1. Sample Size: Full-size units or minimum 2-by-4-inch Samples for sheet and 4-inch long Samples for other products.

    a. Full-size Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.

2. Tag Samples with full product description to coordinate Samples with door hardware schedule.

F. Door Hardware Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant. Coordinate door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Submittal Sequence: Submit door hardware schedule concurrent with submissions of product data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
2. Format: Use same scheduling sequence and format and use same door numbers as in door hardware schedule in the Contract Documents.
3. Content: Include the following information:

    a. Identification number, location, hand, fire rating, size, and material of each door and frame.
    b. Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
    c. Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.

d. Description of electrified door hardware sequences of operation and interfaces with other building control systems.
e. Fastenings and other installation information.
f. Explanation of abbreviations, symbols, and designations contained in door hardware schedule.
g. Mounting locations for door hardware.
h. List of related door devices specified in other Sections for each door and frame.

G. Keying Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of electrified door hardware.

1. Certify that door hardware for use on each type and size of labeled fire-rated doors complies with listed fire-rated door assemblies.

C. Product Test Reports: For compliance with accessibility requirements, for tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.

D. Field quality-control reports.

E. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of door hardware to include in maintenance manuals.

B. Schedules: Final door hardware and keying schedule.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Door Hardware: (4) four replacement cylinders.

1.8 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. Warehousing Facilities: In Project's vicinity.
2. 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 and who is currently certified by DHI as an Architectural Hardware Consultant (AHC) an Architectural Hardware Consultant (AHC) and an Electrified Hardware Consultant (EHC).

1.9 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lockup for door hardware delivered to Project site.

B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.10 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. Failures include, but are not limited to, the following:

   a. Structural failures, including excessive deflection, cracking, or breakage.
   b. Faulty operation of doors and door hardware.
   c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. 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 SOURCE LIMITATIONS

A. Obtain each type of door hardware from single manufacturer.

2.2 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 in accordance with NFPA 252 or UL 10C.

B. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that complies with requirements of assemblies tested in accordance with UL 1784 and installed in compliance with NFPA 105.

1. Air-Leakage Rate: Maximum air leakage of 0.3 cfm per sq. ft. at the tested pressure differential of 0.3 inch wg of water.

C. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

D. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the USDOJ's "2010 ADA Standards for Accessible Design" ICC A117.1.

1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
2. Comply with the following maximum opening-force requirements:

    a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
    b. Sliding or Folding Doors: 5 lbf applied parallel to door at latch.
    c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.
4. Adjust door closer sweep periods so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a position of 12 degrees from the latch.
5. Adjust spring hinges so that, from an open position of 70 degrees, the door will take at least 1.5 seconds to move to the closed position.

2.3 HINGES

A. Hinges: ANSI/BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Baldwin Hardware Corporation.
    b. Hager Companies.
    c. McKinney Products Company; an ASSA ABLOY Group company.
    d. Stanley Commercial Hardware; a division of Stanley Security Solutions.
    e. Or Approved Equal.

2.4 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. Mortise Locks: Minimum 3/4-inch latchbolt throw.

C. Lock Backset: 2-3/4 inches unless otherwise indicated.

D. Lock Trim:
   1. Levers: Cast.
   2. Escutcheons (Roses): Wrought.
   3. Dummy Trim: Match lever lock trim and escutcheons.

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. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.

F. Mortise Locks: ANSI/BHMA A156.13, Operational Grade 1; stamped steel case with steel or brass parts; Series 1000.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Allegion plc.
      b. DORMA USA, Inc.
      c. Hager Companies.
      d. SARGENT Manufacturing Company; ASSA ABLOY.
      e. Stanley Commercial Hardware; a division of Stanley Security Solutions.
      f. Yale Security Inc; an ASSA ABLOY Group company.

2.5 EXIT DEVICES AND AUXILIARY ITEMS

A. Exit Devices and Auxiliary Items: ANSI/BHMA A156.3.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Adams Rite Manufacturing Co; an ASSA ABLOY Group company.
      b. Allegion plc.
      c. Arrow USA; an ASSA ABLOY Group company.
      d. Corbin Russwin, Inc.; an ASSA ABLOY Group company.
      e. DORMA USA, Inc.

f. Hager Companies.
g. SARGENT Manufacturing Company; ASSA ABLOY.
h. Stanley Commercial Hardware; a division of Stanley Security Solutions.
i. Yale Security Inc; an ASSA ABLOY Group company.
j. Or Approved equal.

2.6 LOCK CYLINDERS

A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver. Provide cylinder from same manufacturer of locking devices.

B. Standard Lock Cylinders: ANSI/BHMA A156.5, Grade 1 permanent cores; face finished to match lockset.

1. Core Type: Interchangeable.

C. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.

D. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

2.7 KEYING

A. Keying System: Factory registered, complying with guidelines in ANSI/BHMA A156.28, appendix. Provide one extra key blank for each lock. Incorporate decisions made in keying conference.

1. Master Key System: Change keys and a master key operate cylinders.

a. Provide three cylinder change keys and five master keys.

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."

2.8 KEY CONTROL SYSTEM

A. Key Control Cabinet: ANSI/BHMA A156.28; metal cabinet with baked-enamel finish, containing key-holding hooks, labels, two sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers; with key capacity of 50 percent of the number of locks.

2.9 OPERATING TRIM

A. Operating Trim: ANSI/BHMA A156.6; stainless steel unless otherwise indicated.

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

a. Allegion plc.
b. Hager Companies.
c. Rockwood Manufacturing Company; an ASSA ABLOY Group company.
d. Trimco.
e. Or Approved Equal.

2.10 ACCESSORIES FOR PAIRS OF DOORS

A. Coordinators: ANSI/BHMA A156.3; consisting of active-leaf, hold-open lever, and inactive-leaf release trigger; fabricated from steel with nylon-coated strike plates; with built-in, adjustable safety release; and with internal override.

B. Astragals: ANSI/BHMA A156.22.

2.11 SURFACE CLOSERS

A. Surface Closers: ANSI/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.

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

a. Allegion plc.
b. DORMA USA, Inc.
c. Hager Companies.
d. Norton Door Controls; an ASSA ABLOY Group company.
e. Rixson Specialty Door Controls; an ASSA ABLOY Group company.
f. SARGENT Manufacturing Company; ASSA ABLOY.
g. Stanley Commercial Hardware; a division of Stanley Security Solutions.
h. Yale Security Inc; an ASSA ABLOY Group company.
i. Or Approved Equal.

2.12 OVERHEAD STOPS AND HOLDERS

A. Overhead Stops and Holders: ANSI/BHMA A156.8.

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

a. Allegion plc.
b. Architectural Builders Hardware Mfg., Inc.
c. DORMA USA, Inc.
d. Hager Companies.
e. Rixson Specialty Door Controls; an ASSA ABLOY Group company.
f. SARGENT Manufacturing Company; ASSA ABLOY.
g. Or Approved Equal.

2.13 DOOR GASKETING

A. Door Gasketing: ANSI/BHMA A156.22; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

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

a. Hager Companies.
b. M-D Building Products, Inc.
c. National Guard Products, Inc.
d. Pemko Manufacturing Co.
e. Reese Enterprises, Inc.
f. Or Approved Equal.

B. Maximum Air Leakage: When tested in accordance with ASTM E283/E283M with tested pressure differential of 0.3 inch wg, as follows:

1. Smoke-Rated Gasketing: 0.3 cfm/sq. ft. of door opening.
2. Gasketing on Single Doors: 0.3 cfm/sq. ft. of door opening.
3. Gasketing on Double Doors: 0.50 cfm per ft. of door opening.

2.14 THRESHOLDS

A. Thresholds: ANSI/BHMA A156.21; fabricated to full width of opening indicated.

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

a. Hager Companies.
b. M-D Building Products, Inc.
c. National Guard Products, Inc.
d. Pemko Manufacturing Co.
e. Reese Enterprises, Inc.
f. Rixson Specialty Door Controls; an ASSA ABLOY Group company.
g. Or Approved Equal.

2.15 AUXILIARY DOOR HARDWARE

A. Auxiliary Door Hardware: ANSI/BHMA A156.16.

2.16 FABRICATION

A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rating labels and as otherwise approved by Architect.

1. Manufacturer's identification is permitted on rim of lock cylinders only.

B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and ANSI/BHMA A156.18.

C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended; however, aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
2. Fire-Rated Applications:

a. Wood or Machine Screws: For the following:

1) Hinges mortised to doors or frames.
2) Strike plates to frames.
3) Closers to doors and frames.

b. Steel Through Bolts: For the following unless door blocking is provided:

1) Surface hinges to doors.
2) Closers to doors and frames.
3) Surface-mounted exit devices.

3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
4. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.17 FINISHES

A. Provide finishes complying with ANSI/BHMA A156.18 as indicated in door hardware schedule.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance of the Work.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

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

3.2 PREPARATION

A. Steel Doors and Frames: For surface-applied door hardware, drill and tap doors and frames in accordance with ANSI/SDI A250.6.

3.3 INSTALLATION

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. Custom Steel Doors and Frames: HMMA 831.

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.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

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 of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

D. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule, but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30 inches of door height greater than 90 inches.

E. Lock Cylinders: Install construction cores to secure building and areas during construction period.

1. Replace construction cores with permanent cores as directed by Owner.

F. Key Control System:

1. Key Control Cabinet: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

G. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."

H. 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.

I. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

J. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 FIELD QUALITY CONTROL

A. Independent Architectural Hardware Consultant: Engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
2. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 70 degrees and so that closing time complies with accessibility requirements of authorities having jurisdiction.
3. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.

B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer's Architectural Hardware Consultant is to examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.6 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

B. Maintenance Service: Beginning at Substantial Completion, maintenance service is to include 12 months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door and door hardware operation. Parts and supplies are to be manufacturer's authorized replacement parts and supplies.

3.8 DEMONSTRATION

A. Engage Installer to train Owner's maintenance personnel to adjust, operate, and maintain door hardware.

3.9 DOOR HARDWARE SCHEDULE

Door No.	Description	Hdwr Set	Remarks
001	Elec. Room	1.0	H.M.
002	Utility Room 1	2.0	H.M.
003	Storage room	2.0	H.M.
103	IDF Room	1.0	H.M.
303	IDF Room	1.0	H.M.
304	ECR	1.0	H.M.
401	Stair Tower A	3.0	Alum.&Glass
402	Stair tower B	3.0	Alum.&Glass
403	Stair C	3.0	Alum.&Glass
D1	Restroom	4.0	H.M.
D2	Storage	1.0	H.M.
D3	Repair Shop	Per Manuf.	Roll Down Door
D4	Repair Shop	1.0	H.M.
D5	Repair Shop	3.0	Alum.&Glass

Hardware Sets

Set: 1.0 (Storeroom Function)

Doors: 001, 103, 303, 304, E-Bike D2 & D4

3	Hinge - tamperproof		US26D
1	Exit device	Panic hardware, lever on exterior	US26D
1	Mortise lockset		629
1	Cylinder core		626
1	Construction core		626
1	Closer		AL
1	Overhead stop		AL
1	Set Weatherstrip		MIL
1	Door sweep		MIL
1	Threshold		MIL
1	Lockguard		630
1	Kickplate	Mounted on exterior	630

Set: 2.0 (Storeroom Function double door)

Doors: 002, 003

6	Hinge - Tamperproof		US26D
1	Exit Device	Panic hardware, lever on exterior	US26D
1	Mortise lockset		626
1	Cylinder core		626
1	Construction core		626
1	Closer		AL
1	Overhead stop	Hold open function at 003	AL
1	Set weatherstrip		MIL
1	Door sweep		MIL
1	Threshold		MIL
2	Automatic flush bolt		US26D
4	Kickplate		630
1	Overlapping astragal	By door supplier	

Set: 3.0 (Aluminum Door)

Doors: 401, 402, 403, E-Bike D5

3	Hinge tamperproof		US26D
1	Exit device	Panic Hardware, lever on interior	US26D
1	Closer		AL
1	Cylinder core		626
1	Construction core		626
1	Closer		AL
1	Overhead stop		AL
1	Set weatherstrip		MIL
1	Door sweep	Integral drip cap	MIL
1	Threshold		MIL

Set: 4.0 (Toilet Rm. Function)

Doors: E-Bike D1

3	Hinge		US26D
1	Privacy Set	Lever with thumb lock	
1	Closer		AL
1	Kick Plate		630
1	Overhead Door Stop		AL

3	Silencer	
1	Coat Hook	US26D

END OF SECTION 087100

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glass products.
2. Laminated glass.
3. Insulating glass.
4. Miscellaneous glazing materials.

B. Related Requirements:
1. Section 084113 "Aluminum-Framed Entrances and Storefronts"
2. Section 084413 "Glazed Aluminum Curtain Wall."

1.2 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters in accordance with ASTM C1036.

C. IBC: International Building Code.

D. Interspace: Space between lites of an insulating-glass unit.

1.3 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances to achieve proper safety margins for glazing retention under each design load case, load case combination, and service condition.

1.4 PREINSTALLATION MEETINGS

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review temporary protection requirements for glazing during and after installation.

1.5 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 square.

C. Glazing Accessory Samples: For sealants and colored spacers, in 12-inch lengths. Install sealant Samples between two strips of material representative in color of adjoining framing system.

D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

E. 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.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer manufacturers of fabricated glass units glass testing agency and sealant testing agency.

B. Product Certificates: For glass.

C. Product Test Reports: For fabricated glass and glazing sealants, for tests performed by a qualified testing agency.

1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

D. Preconstruction adhesion and compatibility test report.

E. Sample Warranties: For special warranties.

1.7 QUALITY ASSURANCE

A. Fabricated-Glass Manufacturer Qualifications: A qualified manufacturer of fabricated glass units who is approved and certified by primary glass manufacturer.

B. Installer Qualifications: A qualified glazing contractor for this Project who is certified under the North American Contractor Certification Program (NACC) for Architectural Glass & Metal (AG&M) contractors and who employs glazing technicians certified under the Architectural Glass and Metal Technician (AGMT) certification program.

C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.

E. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Install glazing in mockups specified in Section 084113 "Aluminum-Framed Entrances and Storefronts" Section 084413 "Glazed Aluminum Curtain Walls" to match glazing systems required for Project, including glazing methods.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
2. Use ASTM C1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
3. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
4. Schedule enough time for testing and analyzing results to prevent delaying the Work.
5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials in accordance with manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F.

1.11 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: 10 years 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: 10 years 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: 10 years from date of Substantial Completion.

D. Manufacturer's Special Warranty for Heat-Soaked Tempered Glass: Manufacturer agrees to replace heat-soaked tempered glass units that spontaneously break due to nickel sulfide (NiS) inclusions at a rate exceeding 0.3 percent (3/1000) within specified warranty period. Coverage for any other cause is excluded.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Glass: Obtain glass from single source from single manufacturer.

B. Source Limitations for Glazing Accessories: For each product and installation method, obtain from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design glazing.

C. 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.

   a. Wind Design Data: As indicated on Drawings.
2. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
3. Thermal Loads: Design glazing to resist thermal stress breakage induced by differential temperature conditions and limited air circulation within individual glass lites and insulated glazing units.

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. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
2. For laminated-glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
4. U-Factors: Center-of-glazing values, in accordance with NFRC 100 and based on most current non-beta version of LBL's WINDOW computer program, expressed as Btu/sq. ft. x h x deg F.
5. SHGC and Visible Transmittance: Center-of-glazing values, in accordance with NFRC 200 and based on most current non-beta version of LBL's WINDOW computer program.
6. Visible Reflectance: Center-of-glazing values, in accordance with NFRC 300.

2.3 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: "Laminated Glazing Reference Manual" and "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.

D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than thickness indicated.

1. Minimum Glass Thickness for Exterior Lites: 6 mm.

2.4 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C1036, Type I, Class 1 (clear), Quality-Q3.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Cardinal Glass Industries, Inc.
b. Guardian Glass LLC.
c. Pilkington North America; NSG Group.
d. Vitro Architectural Glass.
e. Or Approved Equal.

B. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

C. Heat-Strengthened Float Glass: ASTM C1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

D. Reflective- and Low-E-Coated Vision Glass: ASTM C1376.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Cardinal Glass Industries, Inc.
b. Guardian Glass LLC.
c. Pilkington North America; NSG Group.
d. Saint-Gobain Glass Corp.
e. Vitro Architectural Glass.
f. Or Approved Equal.

2.5 LAMINATED GLASS

A. Laminated Glass: ASTM C1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written instructions.
2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
3. Interlayer Color: Clear unless otherwise indicated.

2.6 INSULATING GLASS

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.

2.7 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, recommended in writing by manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks:
1. Type recommended in writing by sealant or glass manufacturer.

D. Spacers:
1. Type recommended in writing by sealant or glass manufacturer.

E. Edge Blocks:
1. Type recommended in writing by sealant or glass manufacturer.

F. 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.

2.8 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

    a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

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

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. 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.

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch-minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and in accordance with requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended in writing by gasket manufacturer.

3.4 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.

3.5 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.

D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.6 MONOLITHIC GLASS SCHEDULE

A. Clear Glass Type G1, refer to drawings: Fully tempered float glass.

1. Minimum Thickness: 6 mm.
2. Safety glazing required.

3.7 INSULATING GLASS SCHEDULE

A. Clear Insulating Glass Type: G2
1. Overall Unit Thickness: 1 inch.
2. Minimum Thickness of Each Glass Lite: 6 mm.
3. Outdoor Lite: Fully tempered float glass.
4. Interspace Content: Argon.
5. Indoor Lite: Fully tempered float glass.
6. Safety glazing required.

B. Low-E-Coated, Clear Insulating Glass Type: G3
1. Overall Unit Thickness: 1 inch.
2. Minimum Thickness of Each Glass Lite: 6 mm.
3. Outdoor Lite: Fully tempered float glass.
4. Interspace Content: Argon.
5. Indoor Lite: Fully tempered float glass.
6. Low-E Coating: Sputtered on second surface.
7. Safety glazing required.

3.8 INSULATING-LAMINATED-GLASS SCHEDULE

A. Low-E-Coated, Clear Insulating Laminated Glass Type:
   1. Overall Unit Thickness: 1-3/16 inch.
   2. Minimum Thickness of Outdoor Lite: 6 mm.
   3. Outdoor Lite: Clear heat-strengthened float glass.
   4. Interspace Content: Argon.
   5. Indoor Lite: Clear laminated glass with two plies of heat-strengthened float glass.
      a. Minimum Thickness of Each Glass Ply: 5 mm.
      b. Interlayer Thickness: 0.060 inch.
   6. Low-E Coating: Pyrolytic on second surface.
   7. Safety glazing required.

END OF SECTION 088000

SECTION 088300 - MIRRORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silvered flat glass mirrors.

B. Related Requirements:
1. Section 102800 "Toilet Accessories" for metal-framed mirrors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Mirrors: Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.

B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachment details.

C. Samples: For each type of the following:

1. Mirrors: 12 inches square, including edge treatment on two adjoining edges.
2. Mirror Clips: Full size.
3. Mirror Trim: 12 inches long.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of mirror.

B. Qualification Statements: For Installer.

C. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For mirrors to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified Installer, who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Mirror Mastic Compatibility Test: Submit mirror mastic products to mirror manufacturer for testing to determine compatibility of mastic with mirror backing.

1. Testing is not required if data are submitted based on previous testing of mirror mastic products and mirror backing matching those submitted.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect mirrors in accordance with mirror manufacturer's written instructions and as needed to prevent damage to mirrors from moisture, condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Source Limitations for Mirrors: Obtain mirrors from single source from single manufacturer.

B. Source Limitations for Mirror Accessories: Obtain mirror-glazing accessories from single source.

2.2 SILVERED FLAT GLASS MIRRORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide **Bobrick B-2909** or comparable product by one of the following:

1. Bradley

2. Dreamwalls

B. Mirrors, General: ASTM C1503.

C. Tempered Glass Mirrors: Mirror Glazing Quality Q3 for blemish requirements and complying with ASTM C1048 for Kind FT, Condition A, tempered float glass before silver coating is applied; clear.

1. Nominal Thickness: 5.0 mm.

D. Laminated Mirrors: ASTM C1172, Type II.

1. Glass for Outer Lite: Annealed float glass, Mirror Quality, clear.

2. Nominal Thickness for Outer Lite: 5.0 mm.
3. Glass for Inner Lite: Annealed float glass; ASTM C1036, Type I (transparent flat glass), Quality Q2; Class 1 (tinted).
4. Nominal Thickness: As indicated.
5. Interlayer: Mirror manufacturer's standard 0.030-inch-thick, clear polyvinyl-butyral interlayer with a proven record of showing no tendency to delaminate from, or cause damage to, silver coating.

E. Safety Glazing Products: For laminated mirrors, provide products that comply with 16 CFR 1201, Category II.

2.3 FABRICATION

A. Shop fabricate mirrors to greatest extent possible.

B. Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts, so they fit closely around penetrations in mirrors.

C. Mirror Edge Treatment: Rounded polished.

1. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.

D. Film-Backed Safety Mirrors: Apply film backing with adhesive coating over mirror backing paint, as recommended in writing by film-backing manufacturer, to produce a surface free of bubbles, blisters, and other imperfections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance

with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.

B. Verify compatibility with and suitability of substrates, including compatibility of existing finishes or primers with mirror mastic.

C. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

3.3 INSTALLATION OF MIRRORS

A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced National Glass Association (NGA) publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.

1. NGA Publications: "Laminated Glazing Reference Manual," "Glazing Manual" and "Installation Techniques Designed to Prolong the Life of Flat Glass Mirrors."

B. Provide a minimum airspace of 1/8 inch between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.

C. Install mirrors with mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.

1. Aluminum J-Channels: Provide setting blocks 1/8 inch thick by 4 inches long at quarter points. To prevent trapping water, provide, between setting blocks, two slotted weeps not less than 1/4 inch wide by 3/8 inch long at bottom channel.
2. Aluminum J-Channels and Cleat: Fasten J-channel directly to wall and attach top trim to continuous cleat fastened directly to wall.
3. Mirror Clips: Place a felt or plastic pad between mirror and each clip to prevent spalling of mirror edges. Locate clips so they are symmetrically placed and evenly spaced.
4. Install mastic as follows:

a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
c. After mastic is applied, align mirrors and press into place while maintaining a minimum airspace of 1/8 inch between back of mirrors and mounting surface.

3.4 CLEANING AND PROTECTION

A. Protect mirrors from breakage and contaminating substances resulting from construction operations.

B. Do not permit edges of mirrors to be exposed to standing water.

C. Maintain environmental conditions that prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

D. Clean exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Clean mirrors as recommended in writing by mirror manufacturer and NGA's publication "Proper Procedures for Cleaning Flat Glass Mirrors."

END OF SECTION 088300

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Exterior gypsum board for ceilings and soffits.
3. Tile backing panels.

B. Related Requirements:

1. Section 061600 "Sheathing" for gypsum sheathing for exterior walls.
2. Section 092216 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.
3. Section 093013 "Ceramic Tiling" for cementitious backer units installed as substrates for ceramic tile.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Gypsum wallboard.
2. Gypsum board, Type X.
3. Flexible gypsum board.
4. Gypsum ceiling board.
5. Foil-backed gypsum board.
6. Abuse-resistant gypsum board.
7. Impact-resistant gypsum board.
8. Mold-resistant gypsum board.
9. Gypsum board, Type C.
10. Skim-coated gypsum board.
11. Exterior gypsum soffit board.
12. Glass-mat gypsum sheathing board.
13. Glass-mat, water-resistant backing board.
14. Cementitious backer units.
15. Water-resistant gypsum backing board.
16. Interior trim.
17. Exterior trim.
18. Aluminum trim.
19. Joint treatment materials.
20. Laminating adhesive.
21. Sound-attenuation blankets.
22. Acoustical sealant.
23. Textured finishes.

B. Shop Drawings: Show locations and installation of control and expansion joints, including plans, elevations, sections, details of components, and attachments to other work.

C. Samples: For the following products:
   1. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

1.3 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.4 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, and mold damaged.

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

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain each type of gypsum panel and joint finishing material from single source with resources to provide products of consistent quality in appearance and physical properties.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated in accordance with ASTM E119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated in accordance with ASTM E90 and classified in accordance with ASTM E413 by an independent testing agency.

2.3 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.4 INTERIOR GYPSUM BOARD

A. Gypsum Wallboard: ASTM C1396/C1396M.

1. Basis-of-Design Product: Subject to compliance with requirements, provide USG Corporation; [USG Sheetrock® Brand Gypsum Panels] or a comparable product by one of the following:
   a. American Gypsum.
   b. CertainTeed Corporation.
   c. Continental Building Products, LLC.
   d. Georgia-Pacific Building Products.
   e. National Gypsum Company.
   f. PABCO Gypsum.
   g. Temple-Inland Building Products by Georgia-Pacific.
2. Thickness: 5/8 inch.
3. Long Edges: Tapered.

B. Gypsum Board, Type X: ASTM C1396/C1396M.

1. Basis-of-Design Product: Subject to compliance with requirements, provide USG Corporation; USG Sheetrock® Brand EcoSmart Panels Firecode® X or a comparable product by one of the following:
   a. American Gypsum.
   b. CertainTeed Corporation.
   c. Continental Building Products, LLC.
   d. Georgia-Pacific Building Products.
   e. National Gypsum Company.
   f. PABCO Gypsum.
   g. Temple-Inland Building Products by Georgia-Pacific.
   >.
2. Thickness: 5/8 inch.
3. Long Edges: Tapered.

C. Mold-Resistant Gypsum Board: ASTM C1396/C1396M. With moisture- and mold-resistant core and paper surfaces.

1. Basis-of-Design Product: Subject to compliance with requirements, provide USG Corporation; USG Sheetrock® Brand UltraLight Panels Mold Tough or a comparable product by one of the following:
   a. American Gypsum.
   b. CertainTeed Corporation.
   c. Continental Building Products, LLC.
   d. Georgia-Pacific Building Products.
   e. National Gypsum Company.
   f. PABCO Gypsum.

g. Temple-Inland Building Products by Georgia-Pacific.

2. Core: 5/8 inch, Type X.
3. Long Edges: Tapered.
4. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

2.5 TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Board: ASTM C1178/C1178M, with manufacturer's standard edges.

1. Basis-of-Design Product: Subject to compliance with requirements, provide USG Corporation; USG Durock™ Glass-Mat Tile Backerboard or a comparable product by one of the following:
   a. CertainTeed Corporation.
   b. Georgia-Pacific Building Products.
   c. National Gypsum Company.
   d. Temple-Inland Building Products by Georgia-Pacific.

2. Core: 5/8 inch, Type X.
3. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

2.6 TRIM ACCESSORIES

A. Interior Trim: ASTM C1047.

1. Material: Galvanized or aluminum-coated steel sheet, 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.
   g. Curved-Edge Cornerbead: With notched or flexible flanges.

B. Exterior Trim: ASTM C1047.

1. Material: Hot-dip galvanized-steel sheet, plastic, or rolled zinc.
2. Shapes:

   a. Cornerbead.
   b. LC-Bead: J-shaped; exposed long flange receives joint compound.
   c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.

2.7 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C475/C475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Exterior Gypsum Soffit Board: Paper.
3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
4. 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.

    a. Use setting-type compound for installing paper-faced metal trim accessories.

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 Exterior Applications:

1. Exterior Gypsum Soffit Board: Use setting-type taping compound and setting-type, sandable topping compound.
2. Glass-Mat Gypsum Sheathing Board: As recommended by sheathing board manufacturer.

E. 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. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.

2.8 AUXILIARY MATERIALS

A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

C. 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 thick.

2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. 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.

E. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

F. Vapor Retarder: As specified in Section 072600 "Vapor Retarders."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

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

3.2 INSTALLATION AND FINISHING OF PANELS, GENERAL

A. Comply with ASTM C840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.

2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 INSTALLATION OF INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Wallboard Type: As indicated on Drawings.
2. Type X: As indicated on Drawings.
3. Ceiling Type: As indicated on Drawings.
4. Mold-Resistant Type: As indicated on Drawings.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.

3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.

E. Curved Surfaces:

1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch-long straight sections at ends of curves and tangent to them.
2. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.

3.4 INSTALLATION OF EXTERIOR GYPSUM PANELS FOR CEILINGS AND SOFFITS

A. Apply panels perpendicular to supports, with end joints staggered and located over supports.

1. Install with 1/4-inch open space where panels abut other construction or structural penetrations.
2. Fasten with corrosion-resistant screws.

3.5 INSTALLATION OF TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with 1/4-inch gap where panels abut other construction or penetrations.

B. Water-Resistant Backing Board: Install where indicated with 1/4-inch gap where panels abut other construction or penetrations.

C. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.6 INSTALLATION OF TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints in accordance with ASTM C840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. Bullnose Bead: Use at outside corners.
3. LC-Bead: Use at exposed panel edges.
4. L-Bead: Use where indicated on Drawings.
5. U-Bead: Use at exposed panel edges.
6. Curved-Edge Cornerbead: Use at curved openings.

D. Exterior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.

E. Aluminum Trim: Install in locations indicated on Drawings.

3.7 FINISHING OF GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and in accordance with ASTM C840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile.
3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.

    a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

4. Level 5: Where indicated on Drawings.

    a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

E. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.

F. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

G. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.8 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

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

END OF SECTION 092900

SECTION 099114 - EXTERIOR PAINTING (MPI STANDARDS)

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes surface preparation and application of paint systems on exterior substrates.

B. Related Requirements:

1. Section 051213 "Architecturally Exposed Structural Steel Framing" for shop priming of metal substrates.
2. Section 055000 "Metal Fabrications" for shop priming metal fabrications.
3. Section 055213 "Pipe and Tube Railings" for shop primingpaintingpipe and tube railings.
4. Section 099300 "Staining and Transparent Finishing" for surface preparation and the application of wood stains and transparent finishes on exterior wood substrates.
5. Section 099600 "High-Performance Coatings" for tile-like coatings.

1.2 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, in accordance with ASTM D523.

B. MPI Gloss Level 2: Not more than 10 units at 60 degrees, in accordance with ASTM D523.

C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, in accordance with ASTM D523.

D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, in accordance with ASTM D523.

E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, in accordance with ASTM D523.

F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, in accordance with ASTM D523.

G. MPI Gloss Level 7: More than 85 units at 60 degrees, in accordance with 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.
2. Indicate VOC content.

B. Samples for Initial Selection: For each type of topcoat product.

C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in the Exterior Painting Schedule to cross-reference paint systems specified in this Section. Include color designations.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Material: Furnish extra materials, from the same production run, to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.5 MOCKUPS

A. Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide PPG Paints; products as designated in the Exterior Painting Schedule or comparable product by one of the following:

1. Behr Process Corporation.
2. Benjamin Moore & Co.
3. Sherwin-Williams Company (The).

2.2 PAINT PRODUCTS, GENERAL

A. MPI Standards: Provide products complying with MPI standards indicated and listed in its "MPI Approved Products List."

B. Material Compatibility:

1. Materials for use within each paint system to 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 to be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. VOC Content: For field applications, paints and coatings to comply with VOC content limits of authorities having jurisdiction at Project location.

D. Colors: As selected by Architect from manufacturer's full range.

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. Concrete: 12 percent.
2. Fiber-Cement Board: 12 percent.
3. Masonry (Clay and CMUs): 12 percent.
4. Wood: 15 percent.
5. Portland Cement Plaster: 12 percent.
6. Gypsum Board: 12 percent.

C. Portland Cement Plaster Substrates: Verify that plaster is fully cured.

D. Exterior Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

E. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

F. 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 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.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:

1. SSPC-SP 2.
2. SSPC-SP 3.
3. SSPC-SP 7/NACE No. 4.

4. SSPC-SP 11.

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

I. Aluminum Substrates: Remove loose surface oxidation.

J. Wood Substrates:

1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

K. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

A. Apply paints in accordance with manufacturer's written instructions and recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
4. Paint entire exposed surface of window frames and sashes.
5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed to view:

a. Equipment, including.
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.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness (DFT) Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for DFT.

1. Contractor will touch up and restore painted surfaces damaged by testing.
2. If test results show that DFT of applied paint does not comply with paint manufacturer's written instructions, Contractor will pay for testing and apply additional coats as needed to provide DFT that complies with paint manufacturer's written instructions.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

1. Do not clean equipment with free-draining water and prevent solvents, thinners, cleaners, and other contaminants from entering into waterways, sanitary and storm drain systems, and ground.
2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.
3. Allow empty paint cans to dry before disposal.
4. Collect waste paint by type and deliver to recycling or collection facility.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces: Refer to 099600 - HIGH-PERFORMANCE COATINGS for finish painting on architectural walls.

1. Latex System MPI EXT 3.1A:

a. Prime Coat: Primer, alkali resistant, water based, MPI #3.

1) PPG Paints; Seal Grip Interior/Exterior Acrylic Universal Primer/Sealer, 17-921XI; applied at 1.6 mils minimum DFT.
2) PPG Paints; Perma-Crete Interior/Exterior Alkali Resistant Primer, 4-603XI; applied at 1.4 mils minimum DFT.

b. Intermediate Coat: Latex, exterior, matching topcoat.
c. Topcoat: Latex, exterior, flat (MPI Gloss Level 1), MPI #10.

1) PPG Paints; Speedhide Exterior 100% Acrylic Latex Flat, 6-610XI Series; applied at 1.5 mils minimum DFT.
2) PPG Paints; Sun Proof Exterior 100% Acrylic Latex Flat, 72-110XI Series; applied at 1.6 mils minimum DFT.
3) PPG Paints; Acri-Shield Max Exterior 100% Acrylic Latex Flat, 519-10 Series; applied at 1.6 mils minimum DFT.
4) PPG Paints; Permanizer Exterior 100% Acrylic Latex Flat, 759-10 Series; applied at 2.3 mils minimum DFT.

B. Concrete Substrates, Traffic Surfaces:

1. Epoxy Deck Coating System (non-slip):

a. Prime Coat: Epoxy, gloss, matching topcoat.
b. Topcoat: Epoxy, gloss (MPI Gloss Level 6) + NSA.

1) PPG Paints; Amerlock 600 Series High Build Epoxy; applied at 5.0 to 10.0 mils DFT.
2) PPG Paints; HPC High Gloss Epoxy, 95-501 Series; applied at 4.0 to 8.0 mils DFT.

2. Waterborne Alkyd Floor Enamel System MPI EXT 3.2D:

a. Prime Coat: Floor enamel, matching topcoat.
b. Intermediate Coat: Floor enamel, matching topcoat.
c. Topcoat: Floor enamel, waterborne alkyd, gloss (MPI Gloss Level 6), MPI #27.

1) PPG Paints; Floor & Porch Waterborne Alkyd Gloss, 3-610 Series; applied at 1.3 mils minimum DFT.

d. Additive: Manufacturer's standard additive to increase skid resistance of painted surface.

3. Clear Water-Based Sealer System MPI EXT 3.2H:

a. Prime Coat: Sealer, water based, matching topcoat.
b. Intermediate Coat: Sealer, water based, matching topcoat.
c. Topcoat: Sealer, water based, for concrete floors, MPI #99.

1) PPG Paints; Perma-Crete Plex-Seal WB Interior/Exterior 100% Acrylic Clear Sealer, 4-6200XI Series; applied at 0.8 mil minimum DFT.

C. CMU Substrates:

1. High-Performance Latex System MPI EXT 4.2M.

a. Prime Coat: Primer, alkali resistant, water based, MPI #3.

1) PPG Paints; Seal Grip Interior/Exterior Acrylic Universal Primer/Sealer, 17-921XI; applied at 1.6 mils minimum DFT.
2) PPG Paints; Perma-Crete Interior/Exterior Alkali Resistant Primer, 4-603XI; applied at 1.4 mils minimum DFT.

b. Intermediate Coat: Latex, exterior, high performance architectural, matching topcoat.
c. Topcoat: Latex, exterior, high performance architectural, low sheen (MPI Gloss Levels 3 and 4), MPI #315.

1) PPG Paints; Acri-Shield Max Exterior 100% Acrylic Latex Satin, 739-10 Series; applied at 1.6 mils minimum DFT.
2) PPG Paints; Permanizer Exterior 100% Acrylic Latex Satin, 769-10 Series; applied at 2.2 mils minimum DFT.

D. Galvanized-Metal Substrates:

1. High-Performance Latex System MPI EXT 5.3M.

a. Prime Coat: Primer, galvanized, water based, MPI #134.

1) PPG Paints; Pitt-Tech Plus Interior/Exterior Industrial DTM Primer/Finish, 4020PF; applied at 2.0 mils minimum DFT.
2) PPG Paints; Pitt-Tech Plus EP Interior/Exterior Industrial DTM Primer/Finish, 90-1912 Series; applied at 2.0 mils minimum DFT.

b. Intermediate Coat: Latex, exterior, high performance architectural, matching topcoat.

c. Topcoat: Latex, exterior, high performance architectural, semi-gloss (MPI Gloss Level 5), MPI #311.

1) PPG Paints; Acri-Shield Max Exterior 100% Acrylic Latex Semi-Gloss, 649-10 Series; applied at 1.6 mils minimum DFT.
2) PPG Paints; Permanizer Exterior 100% Acrylic Latex Semi-Gloss, 749-10 Series; applied at 2.1 mils minimum DFT.

E. Wood Substrates: Exposed framing.

1. High-Performance Latex System MPI EXT 6.2Q.

    a. Prime Coat: Primer, latex for exterior wood, MPI #6.

        1) PPG Paints; Seal Grip Interior/Exterior Acrylic Universal Primer/Sealer, 17-921XI; applied at 1.6 mils minimum DFT.Retain one of two "Topcoat" subparagraphs below.

    b. Topcoat: Latex, exterior, high performance architectural, low sheen (MPI Gloss Levels 3 and 4), MPI #315.

        1) PPG Paints; Acri-Shield Max Exterior 100% Acrylic Latex Satin, 739-10 Series; applied at 1.6 mils minimum DFT.
        2) PPG Paints; Permanizer Exterior 100% Acrylic Latex Satin, 769-10 Series; applied at 2.2 mils minimum DFT.

F. Wood Substrates: Wood trim Architectural woodwork.

1. High-Performance Latex System MPI EXT 6.3P.

    a. Prime Coat: Primer, latex for exterior wood, MPI #6.

        1) PPG Paints; Seal Grip Interior/Exterior Acrylic Universal Primer/Sealer, 17-921XI; applied at 1.6 mils minimum DFT.

    b. Intermediate Coat: Latex, exterior, high performance architectural, matching topcoat.
    c. Topcoat: Latex, exterior, high performance architectural, low sheen (MPI Gloss Levels 3 and 4), MPI #315.

        1) PPG Paints; Acri-Shield Max Exterior 100% Acrylic Latex Satin, 739-10 Series; applied at 1.6 mils minimum DFT.
        2) PPG Paints; Permanizer Exterior 100% Acrylic Latex Satin, 769-10 Series; applied at 2.2 mils minimum DFT.

G. Wood Substrates: Wood-based panel products.

1. High-Performance Latex System MPI EXT 6.4M.

    a. Prime Coat: Primer, latex for exterior wood, MPI #6.

        1) PPG Paints; Seal Grip Interior/Exterior Acrylic Universal Primer/Sealer, 17-921XI; applied at 1.6 mils minimum DFT.

    b. Prime Coat: Primer, alkyd for exterior wood, MPI #5.

        1) PPG Paints; Seal Grip Interior/Exterior Universal Alkyd Primer/Sealer, 17-941NF; applied at 2.2 mils minimum DFT.

    c. Intermediate Coat: Latex, exterior, high performance architectural, matching topcoat.

d. Topcoat: Latex, exterior, high performance architectural, low sheen (MPI Gloss Levels 3 and 4), MPI #315.

1) PPG Paints; Acri-Shield Max Exterior 100% Acrylic Latex Satin, 739-10 Series; applied at 1.6 mils minimum DFT.
2) PPG Paints; Permanizer Exterior 100% Acrylic Latex Satin, 769-10 Series; applied at 2.2 mils minimum DFT.

H. Exterior Bituminous-Coated Substrates:

1. High-Performance Latex System MPI EXT 10.2E.

a. Prime Coat: Primer, rust inhibitive, water based, MPI #107.

1) PPG Paints; Pitt-Tech Plus EP Interior/Exterior Industrial DTM Primer, 90-1908 Series, applied at 2.0 mils minimum DFT.
2) PPG Paints; Pitt-Tech Plus Interior/Exterior Industrial DTM Primer/Finish, 4020PF Series, applied at 2.0 mils minimum DFT.

b. Intermediate Coat: Latex, exterior, high performance architectural, matching topcoat.

1) PPG Paints; Acri-Shield Max Exterior 100% Acrylic Latex Satin, 739-10 Series; applied at 1.6 mils minimum DFT.
2) PPG Paints; Permanizer Exterior 100% Acrylic Latex Satin, 769-10 Series; applied at 2.2 mils minimum DFT.

c. Topcoat: Latex, exterior, high performance architectural, semi-gloss (MPI Gloss Level 5), MPI #311.

1) PPG Paints; Acri-Shield Max Exterior 100% Acrylic Latex Semi-Gloss, 649-10 Series; applied at 1.6 mils minimum DFT.
2) PPG Paints; Permanizer Exterior 100% Acrylic Latex Semi-Gloss, 749-10 Series; applied at 2.1 mils minimum DFT.

END OF SECTION 099114

SECTION 099124 - INTERIOR PAINTING (MPI STANDARDS)

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes surface preparation and the application of paint systems on interior substrates.

B. Related Requirements:
1. Section 055000 "Metal Fabrications" for shop priming metal fabrications.
2. Section 055213 "Pipe and Tube Railings" for shop priming painting pipe and tube railings.

1.2 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, in accordance with ASTM D523.

B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, in accordance with ASTM D523.

C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, in accordance with ASTM D523.

D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, in accordance with ASTM D523.

E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, in accordance with ASTM D523.

F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, in accordance with ASTM D523.

G. MPI Gloss Level 7: More than 85 units at 60 degrees, in accordance with 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.
2. Indicate VOC content.

B. Sustainable Design Submittals:

1. Product Data: For paints and coatings, indicating VOC content.
2. Laboratory Test Reports: For paints and coatings, indicating compliance with requirements for low-emitting materials.

3. Environmental Product Declaration (EPD): For each product.
4. Health Product Declaration (HPD): For each product.
5. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.
6. Environmental Product Declaration (EPD): For each product.
7. Environmental Product Declaration (EPD): For each product.
8. Environmental Product Declaration (EPD): For each product.
9. Third-Party Certifications: For each product.
10. Third-Party Certified Life-Cycle Assessment: For each product.
11. Manufacturer Inventory: For each product, provide manufacturer's manifest of ingredients.

C. Samples: For each type of topcoat product.

D. Samples for Initial Selection: For each type of topcoat product.

E. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

F. Product List: Use same designations indicated on Drawings and in the Interior Painting Schedule to cross-reference paint systems specified in this Section. Include color designations.

1.4 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. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.5 MOCKUPS

A. Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures of less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide PPG Paints; products as designated in the Interior Painting Schedule for the paint category indicated or comparable product by one of the following:

1. Behr Paint Company; Behr Process Corporation.
2. Benjamin Moore & Co.
3. Sherwin-Williams Company (The).

B. Source Limitations: Obtain each paint product from single source from single manufacturer.

2.2 PAINT, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products List."

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. VOC Content: For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 50.
3. Nonflat Paints and Coatings (High Gloss): 50 g/L.
4. Dry-Fog Coatings: 150 g/L.
5. Floor Coatings: 50 g/L.
6. Industrial Maintenance Coatings: 100 g/L.
7. Primers, Sealers, and Undercoaters: 100 g/L.
8. Rust-Preventive Coatings: 100 g/L.
9. Zinc-Rich Industrial Maintenance Primers: 100 g/L.
10. Pretreatment Wash Primers: 420 g/L.
11. Shellacs, Clear: 730 g/L.
12. Shellacs, Pigmented: 550 g/L.

D. Low-Emitting Materials: For field applications that are inside the weatherproofing system, 75 percent of paints and coatings by volume or surface area shall comply with 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" using CPDH Standard Method v1.2-2017.

E. Material Emissions and Pollutant Control: Not less than 85 percent of field-applied paints and coatings that are inside the weatherproofing system shall comply with either of the following:

1. Low-Emitting Materials: VOC emissions shall comply with 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." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
2. VOC content shall not exceed limits of authorities having jurisdiction and the following:

a. Flat Coatings: 50 g/L.
b. Nonflat Coatings: 100 g/L.
c. Nonflat - High-Gloss Coatings: 150 g/L.
d. Dry-Fog Coatings: 150 g/L.
e. Industrial Maintenance Coatings: 250 g/L.
f. Pretreatment Wash Primers: 420 g/L.
g. Primers, Sealers, and Undercoaters: 100 g/L.
h. Recycled Coatings: 250 g/L.
i. Rust-Preventive Coatings: 250 g/L.

F. Emissions Requirements: Field-applied paints and coatings that are inside the weatherproofing system shall comply with either of the following:

1. Low-Emitting Materials: VOC emissions shall comply with 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."

2. VOC content shall not exceed limits of authorities having jurisdiction and the following:

    a. Flat Coatings: 50 g/L.
    b. Nonflat Coatings: 100 g/L.
    c. Primers, Sealers, and Undercoats: 100 g/L.
    d. Shellacs, Clear: 730 g/L.
    e. Shellacs, Pigmented: 550 g/L.

G. VOC Content: For field applications inside the building, wall paints shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Interior Flat Latex Wall Paint: 50 g/L.
2. Interior Nonflat Latex Wall Paint: 150 g/L.

H. VOC Emissions: For field applications inside the building, wall paints shall contain no more than half of the chronic REL of VOCs when tested in accordance with 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." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit or 33 mcg/cu. m and that of acetaldehyde shall not exceed 9 mcg/cu. m.

I. Colors: As selected by Architect from manufacturer's full range.

1. 10 percent of surface area will be painted with deep tones.

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. Concrete: 12 percent.
2. Fiber-Cement Board: 12 percent.
3. Masonry (Clay and CMUs): 12 percent.
4. Wood: 15 percent.
5. Gypsum Board: 12 percent.
6. Plaster: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Plaster Substrates: Verify that plaster is fully cured.

E. Spray-Textured Ceiling Substrates: Verify that surfaces are dry.

F. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

G. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:

1. SSPC-SP 2.
2. SSPC-SP 3.
3. SSPC-SP 7/NACE No. 4.
4. SSPC-SP 11.

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

I. Aluminum Substrates: Remove loose surface oxidation.

J. Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

K. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 INSTALLATION

A. Apply paints in accordance with manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire-Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in equipment rooms:

a. Equipment, including panelboards.
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. Paint the following work where exposed in occupied spaces:

a. Equipment, including panelboards.
b. Uninsulated metal piping.
c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit.
f. Plastic conduit.
g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
h. Other items as directed by Architect.

3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

A. Dry-Film Thickness (DFT) Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for DFT.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that DFT of applied paint does not comply with paint manufacturer's written instructions, Contractor shall pay for testing and apply additional coats as needed to provide DFT that complies with paint manufacturer's written instructions.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

1. Do not clean equipment with free-draining water and prevent solvents, thinners, cleaners, and other contaminants from entering into waterways, sanitary and storm drain systems, and ground.
2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.
3. Allow empty paint cans to dry before disposal.
4. Collect waste paint by type and deliver to recycling or collection facility.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces: Refer to 099600 HIGH PERFORMANCE COATINGS

B. Concrete Substrates, Traffic Surfaces:

1. Latex Floor Enamel System, MPI INT 3.2A:

a. Prime Coat: Floor paint, latex, matching topcoat.
b. Intermediate Coat: Floor paint, latex, matching topcoat.
c. Topcoat: Floor paint, latex, low gloss (maximum MPI Gloss Level 3).

1) PPG Paints; Floor & Porch 100% Acrylic Latex Satin, 3-510XI Series; applied at 1.0 mil minimum DFT.

2. Alkyd Floor Enamel System, MPI INT 3.2B:

a. Prime Coat: Floor enamel, alkyd, matching topcoat.
b. Intermediate Coat: Floor enamel, alkyd, matching topcoat.
c. Topcoat: Floor enamel, alkyd, gloss (MPI Gloss Level 6).

1) PPG Paints; Floor & Porch Waterborne Alkyd Gloss, 3-610 Series; applied at 1.3 mils minimum DFT.

3. Concrete Stain System, MPI INT 3.2E:

a. First Coat: Stain, interior, for concrete floors, matching topcoat.
b. Topcoat: Stain, interior, for concrete floors.

1) PPG Paints; Perma-Crete Color Seal WB Interior/Exterior 100% Acrylic Concrete Stain, 4-4210XI Series; applied at 1.3 mils minimum DFT.

4. Water-Based Concrete Floor Sealer System, MPI INT 3.2G:

a. First Coat: Sealer, water based, for concrete floors, matching topcoat.
b. Topcoat: Sealer, water based, for concrete floors, MPI #99.

1) PPG Paints; Perma-Crete Plex-Seal WB Interior/Exterior 100% Acrylic Clear Sealer, 4-6200XI Series; applied at 0.8 mil minimum DFT.

C. CMU Substrates:

1. High-Performance Architectural Latex System, MPI INT 4.2D:

a. Block Filler: Latex, interior/exterior, MPI #4.

1) PPG Paints: Speedhide Interior/Exterior Masonry Hi Fill Latex Block Filler, 6-15XI; applied at 8.0 mils minimum DFT.
2) PPG Paints; Perma-Crete Concrete Block & Masonry Surfacer/Filler, 4-100XI; applied at 8.0 mils minimum DFT.

b. Prime Coat: Primer, alkali resistant, water based, MPI #3.

1) PPG Paints; Seal Grip Gripper Interior/Exterior Acrylic Universal Primer/Sealer, 17-921XI; applied at 1.6 mils minimum DFT.
2) PPG Paints; Perma-Crete Interior/Exterior Alkali Resistant Primer, 4-603XI; applied at 1.4 mils minimum DFT.

c. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.

d. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 1), MPI #142.

1) PPG Paints; Pure Performance Paint & Primer in One, 100% Acrylic Latex Flat, 9-110XI Series; applied at 1.4 mils minimum DFT.
2) PPG Paints; Prominence Interior 100 percent Acrylic Latex Paint & Primer in One Flat, 84-3110 Series; applied at 1.8 mils minimum DFT.

D. Stainless Steel Substrates:

1. High-Performance Architectural Latex System, MPI INT 5.6G:

a. Prime Coat: Primer, bonding, solvent based, MPI #69.

1) PPG Paints; Seal Grip Interior/Exterior Universal Alkyd Primer/Sealer, 17-941NF; applied at 2.2 mils minimum DFT.

b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.

c. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 1), MPI #142.

1) PPG Paints; Pure Performance Paint & Primer in One, 100% Acrylic Latex Flat, 9-110XI Series; applied at 1.4 mils minimum DFT.
2) PPG Paints; Prominence Interior 100 percent Acrylic Latex Paint & Primer in One Flat, 84-3110 Series; applied at 1.8 mils minimum DFT.

E. Wood Substrates: Glued-laminated construction.

1. High-Performance Architectural Latex System, MPI INT 6.1N:

a. Prime Coat: Primer, latex, for interior wood, MPI #39.

1) PPG Paints; Seal Grip Gripper Interior/Exterior 100% Acrylic Universal Primer/Sealer, 17-921XI Series; applied at 1.6 mils minimum DFT.

b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.

c. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 1), MPI #142.

1) PPG Paints; Pure Performance Paint & Primer in One, 100% Acrylic Latex Flat, 9-110XI Series; applied at 1.4 mils minimum DFT.
2) PPG Paints; Prominence Interior 100 percent Acrylic Latex Paint & Primer in One Flat, 84-3110 Series; applied at 1.8 mils minimum DFT.

F. Wood Substrates: Wood trim Architectural woodwork.

1. High-Performance Architectural Latex System, MPI INT 6.3A:

a. Prime Coat: Primer, latex, for interior wood, MPI #39.

1) PPG Paints; Seal Grip Gripper Interior/Exterior 100% Acrylic Universal Primer/Sealer, 17-921XI Series; applied at 1.6 mils minimum DFT.

b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.

c. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 1), MPI #142.

1) PPG Paints; Pure Performance Paint & Primer in One, 100% Acrylic Latex Flat, 9-110XI Series; applied at 1.4 mils minimum DFT.
2) PPG Paints; Prominence Interior 100 percent Acrylic Latex Paint & Primer in One Flat, 84-3110 Series; applied at 1.8 mils minimum DFT.

G. Gypsum Board Substrates:

1. High-Performance Architectural Latex System, MPI INT 9.2B:

a. Prime Coat: Primer sealer, latex, interior, MPI #50.

1) PPG Paints: Speedhide Interior Latex Quick-Drying Sealer, 6-2; applied at 1.0 mil minimum DFT.
2) PPG Paints: Speedhide Zero Interior Latex Sealer, 6-4900XI; applied at 1.4 mils minimum DFT.
3) PPG Paints; Pure Performance Interior Latex Primer, 9-900; applied at 1.4 mils minimum DFT.

b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.

c. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 1), MPI #142.

1) PPG Paints; Pure Performance Paint & Primer in One, 100% Acrylic Latex Flat, 9-110XI Series; applied at 1.4 mils minimum DFT.
2) PPG Paints; Prominence Interior 100 percent Acrylic Latex Paint & Primer in One Flat, 84-3110 Series; applied at 1.8 mils minimum DFT.

H. Bituminous-Coated Substrates:

1. Latex System, MPI INT 10.2A:

a. Prime Coat: Primer, rust inhibitive, water based, MPI #107.

1) PPG Paints; Pitt-Tech Plus EP Interior/Exterior Industrial DTM Primer, 90-1908, applied at 2.0 mils minimum DFT.

b. Intermediate Coat: Latex, interior, matching topcoat.

c. Topcoat: Latex, interior, flat (MPI Gloss Level 1), MPI #53.

1) PPG Paints; Speedhide Pro-EV Zero Interior Latex Flat, 12-110XI Series; applied at 1.3 mils minimum DFT.
2) PPG Paints; Speedhide Interior Latex Ultra-Flat, 6-0011 Series; applied at 1.3 mils minimum DFT.
3) PPG Paints; Speedhide Interior Latex Flat, 6-70 Series; applied at 1.3 mils minimum DFT.
4) PPG Paints; Speedhide Zero Interior Latex Flat, 6-5110 Series; applied at 1.2 mils minimum DFT.
5) PPG Paints; Hi-Hide Interior Latex Ultra-Flat, 679-10 Series; applied at 1.6 mils minimum DFT.
6) PPG Paints; Hi-Hide Interior Latex Flat, 689-10 Series; applied at 1.1 mils minimum DFT.
7) PPG Paints; Hi-Hide Interior Latex Ceramic Matte, 369-10 Series; applied at 1.4 mils minimum DFT.
8) PPG Paints; Pure Performance Paint & Primer in One, 100% Acrylic Latex Flat, 9-110XI Series; applied at 1.4 mils minimum DFT.

END OF SECTION 099124

SECTION 099600 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Surface preparation and application of high-performance coating systems on the following exterior and interior substrates:

a. Concrete, vertical and horizontal surfaces.
b. Concrete masonry units (CMUs).
c. Steel.
d. Galvanized metal.
e. Aluminum (not anodized or otherwise coated).
f. Stainless steel.

B. Related Requirements:
1. Section 055213 "Pipe and Tube Railings" for shop priming painting pipe and tube railings with coatings specified in this Section.
2. Section 099113 "Exterior Painting" for general field painting.
3. Section 099123 "Interior Painting" for general field painting.

1.2 DEFINITIONS

A. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, in accordance with ASTM D523.

B. Gloss Level 5: 35 to 70 units at 60 degrees, in accordance with ASTM D523.

C. Gloss Level 6: 70 to 85 units at 60 degrees, in accordance with ASTM D523.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include preparation requirements and application instructions.

1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
2. Indicate VOC content.

B. Samples for Initial Selection: For each type of topcoat product indicated.

C. Samples for Verification: For each type of coating system and in each color and gloss of topcoat indicated.

1. Submit Samples on rigid backing, 8 inches square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: Use same designations indicated on Drawings and in Exterior and Interior High-Performance Coating Schedule. Include color designations and product runs (batch numbers).

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run (batch number, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Coatings: 5 percent, but not less than 1 gal. of each material and color applied.

1.5 MOCKUPS

A. Apply mockups of each coating system indicated 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 coating system specified in Part 3.

a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft..
b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 deg F.

B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Sherwin-Williams Company (The); products listed below in the Exterior and Interior High-Performance Coating Schedule[**s**] for the coating category indicated or comparable product from one of the following:

1. Benjamin Moore & Co.
2. PPG Paints.

B. Comparable Products: Comparable products of approved manufacturers will be considered in accordance with Section 016000 "Product Requirements," and the following:

1. Products are approved by manufacturer in writing for application specified.
2. Products meet performance and physical characteristics of basis of design product including published ratio of solids by volume, plus or minus two percent.

C. Source Limitations: Obtain paint materials from single source from single listed manufacturer.

1. Manufacturer's designations listed on a separate color schedule are for color reference only and do not indicate prior approval.

2.2 PAINT MATERlALS – GENERAL

A. Paints and Coatings:
1. Unless otherwise indicated, provide factory-mixed coatings. When required, mix coatings to correct consistency in accordance with manufacturer's instructions before application. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
2. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color. Or follow manufactures product instructions for optimal color conformance.

B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

C. Coating Application Accessories: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required, per manufacturer's specifications.

2.3 INTERIOR PAINT AND COATING SYSTEMS

A. Concrete: Walls and Ceilings, Poured Concrete, Precast Concrete, Unglazed Brick, Cement Board, Tilt-Up, Cast-In-Place including Plaster Walls and Ceilings.
   1. Latex Systems:
      a. Flat Finish:
         1) 1st Coat: S-W Loxon Concrete and Masonry Primer Sealer, LX02W50 (8 mils wet, 3.2 mils dry).
         2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-12600 Series.
         3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-12600 Series (4 mils wet, 1.6 mils dry per coat).

2.4 EXTERIOR PAINT AND COATING SYSTEMS

A. Concrete: Walls and Ceilings, Poured Concrete, Precast Concrete, Unglazed Brick, Cement Board, Tilt-Up, Cast-In-Place including Plaster Walls and Ceilings.
   1. Textured Masonry System:
      a. Smooth Finish; Waterbased:
         1) 1st Coat: S-W Loxon XP, LX11W50 Series.

2.5 2nd Coat: S-W Loxon XP, LX11W50 Series (14.0-18.0 mils wet; 6.4-8.3 mils dry per coat).HIGH-PERFORMANCE COATINGS, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and are listed in "MPI Approved Products List."

B. Material Compatibility:

   1. Provide materials for use within each coating system that are 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 coating system, provide products recommended in writing by manufacturers of topcoat for use in coating system and on substrate indicated.
   3. Provide products of same manufacturer for each coat in a coating system.

C. VOC Content: For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

   1. Flat Paints and Coatings: 50 g/L.
   2. Nonflat Paints and Coatings: 150 g/L.
   3. Primers, Sealers, and Undercoaters: 200 g/L.
   4. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
   5. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
   6. Pretreatment Wash Primers: 420 g/L.
   7. Floor Coatings: 100 g/L.
   8. Shellacs, Clear: 730 g/L.
   9. Shellacs, Pigmented: 550 g/L.

D. Colors: As selected by Architect from manufacturer's full range and or.

2.6 SOURCE QUALITY CONTROL

A. Testing of Coating Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample coating materials. Contractor will be notified in advance and may be present when samples are taken. If coating materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Do not begin installation until substrates have been properly prepared; notify Architect of unsatisfactory conditions before proceeding. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Proceed with work only after conditions have been corrected and approved by all parties, otherwise application of coatings will be considered as an acceptance of surface conditions.

D. Previously Painted Surfaces: Verify that existing painted surfaces do not contain lead based paints, notify Architect immediately if lead based paints are encountered.

E. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Fiber-Cement Board: 12 percent.
3. Clay Masonry: 12 percent.
4. CMUs: 12 percent.
5. Wood: 15 percent.
6. Gypsum Board: 12 percent.
7. Plaster: 12 percent.

F. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

G. Plaster Substrates: Verify that plaster is fully cured.

H. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

I. 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 indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted.

1. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
2. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed.
3. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk.

1. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
2. Clean surfaces with pressurized water. Use pressure range of 1500 to 4000 psi at 6 to 12 inches.
3. Abrasive blast clean surfaces to comply with SSPC-SP 7/NACE No. 4.

E. Masonry Substrates: Remove efflorescence and chalk.

1. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove rust, loose mill scale, and shop primer if any.

1. Clean using methods recommended in writing by manufacturer.

a. SSPC-SP 7/NACE No. 4.
b. SSPC-SP 11.
c. SSPC-SP 6/NACE No. 3.
d. SSPC-SP 10/NACE No. 2.

e. SSPC-SP 5/NACE No. 1.

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded.Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.

3.3 APPLICATION

A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

1. Use applicators and techniques suited for coating and substrate indicated.
2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner will engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.

1. Contractor shall touch up and restore coated surfaces damaged by testing.
2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

B. Protect work of other trades against damage from coating operation. Correct damage to work of other trades by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

C. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. Concrete Substrates, Vertical Surfaces:

1. Epoxy System MPI EXT 3.1D:

a. Prime Coat: Epoxy, matching topcoat.
b. Intermediate Coat: Epoxy, matching topcoat.
c. Topcoat: Epoxy, gloss, (Gloss Level 6), MPI #77.

1) S-W Tile Clad HS Epoxy B62 Series.

2. Epoxy-Modified Latex System MPI EXT 3.1E:

a. Prime Coat: Epoxy-modified latex, matching topcoat.
b. Intermediate Coat: Epoxy-modified latex, matching topcoat.
c. Topcoat: Epoxy-modified latex, gloss, (Gloss Level 6), MPI #115.

1) S-W Pro Industrial Waterbased Catalyzed Epoxy B73 Series.

B. Concrete Substrates, Horizontal Surfaces:

1. Pigmented Polyurethane over Epoxy Slip-Resistant Deck Coating System:

a. Prime Coat: Epoxy, gloss , (Gloss Level 6), MPI #82.

1) S-W Armorseal 1000 HS, B67W2001 Series.

b. Intermediate: Polyurethane, matching topcoat.
c. Topcoat: Polyurethane, two-component, pigmented, gloss, (Gloss Level 6), MPI #212.

1) S-W Armorseal HS Polyurethane, B65W220 Series, with manufacturer's recommended slip-resistant aggregate.

C. CMU Substrates:

1. Epoxy System MPI EXT 4.2E:

a. Block Filler: Block filler, epoxy, MPI #116.

1) S-W Kem Cati-Coat HS Epoxy.

b. Intermediate Coat: Epoxy, matching topcoat.
c. Topcoat: Epoxy, gloss, (Gloss Level 6), MPI #77.

1) S-W Tile Clad HS Epoxy B62 Series.

2. Pigmented Polyurethane over High-Build Epoxy System MPI EXT 4.2G:

a. Block Filler: Block filler, epoxy, MPI #116.

1) S-W Kem Cati-Coat HS Epoxy.

b. Intermediate Coat: Epoxy, high build, low gloss, MPI #108.

1) S-W Macropoxy 646 FC Epoxy B58 Series.

c. Topcoat: Polyurethane, two-component, pigmented, gloss, (Gloss Level 6), MPI #72.

1) S-W Acrolon 218 HS Polyurethane.

D. Galvanized-Metal Substrates:

1. Epoxy over Epoxy Primer System MPI INT 5.3D:

a. Prime Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.

1) S-W Duraplate 235 Multi-purpose Epoxy.

b. Intermediate Coat: Epoxy, matching topcoat.
c. Topcoat: Epoxy, gloss, (Gloss Level 6), MPI #77.

1) S-W Tile Clad HS Epoxy B62 Series.

E. Stainless-Steel Substrates:

1. Epoxy System MPI INT 5.6C:

a. Prime Coat: Primer, vinyl wash, MPI #80.

1) S-W Industrial Wash Primer B60G2.

b. Intermediate Coat: Epoxy, matching topcoat.
c. Topcoat: Epoxy, gloss, (Gloss Level 6), MPI #77.

1) S-W Tile Clad HS Epoxy B62 Series.

F. Gypsum Board Substrates:

1. Epoxy System MPI INT 9.2E:

a. Prime Coat: Primer sealer, latex, interior, MPI #50.

1) S-W ProMar 200 Zero VOC Latex Primer B28W2600.

b. Intermediate Coat: Epoxy, matching topcoat.
c. Topcoat: Epoxy, gloss, (Gloss Level 6), MPI #77.

1) S-W Tile Clad HS Epoxy B62 Series.

END OF SECTION 099600

SECTION 101440 - PARKING GARAGE SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Directional signs for the interior of the garage.
2. Pedestrian messaging and non-illuminated life safety signs for the interior of the garage.
3. Illuminated channel letter signs.
4. Cast letter signs.
5. Signage accessories.
6. Panel signs for E-Bike Facility

B. Related Requirements:

1. Section 142123.16 “Machine Room-Less Electric Traction Passenger Elevators” for code-required conveying equipment signage.
2. Section 220553 "Identification for Plumbing Piping and Equipment" for labels, tags, and nameplates for plumbing systems and equipment.
3. Section 230553 "Identification for HVAC Piping and Equipment" for labels, tags, and nameplates for HVAC systems and equipment.
4. Section 260553 "Identification for Electrical Systems" for labels, tags, and nameplates for electrical equipment.
5. Section 265213 "Emergency and Exit Lighting" for illuminated, self-luminous, and photoluminescent exit sign units.

1.2 DEFINITIONS

A. Accessible: In accordance with the accessibility standard.

B. Illuminated: Illuminated by lighting source integrally constructed as part of the sign unit.

1.3 COORDINATION

A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

B. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Directional signs for the interior of the garage.
2. Pedestrian messaging and non-illuminated life safety signs for the interior of the garage.
3. Illuminated channel letter signs.
4. Cast letter signs.
5. Signage accessories.
6. Panel signs for E-Bike Facility

B. Shop Drawings: For parking garage and E-Bike Facility signs.

1. Include plans, elevations, and large-scale sections of typical members and other components. Show mounting methods, grounds, mounting heights, layout, spacing, reinforcement, accessories, and installation details.
2. Include fabrication and installation details and attachments to other work.
3. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
4. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign.
5. Show locations of electrical service connections.
6. Include diagrams for power, signal, and control wiring.

C. Samples for Initial Selection: For each type of sign material indicated that involves color selection.

D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:

1. Signs: Full-size Sample.
2. Dimensional Characters: Full-size Samples of each type of dimensional character (letter and number) required. Show character style, material, finish, and method of attachment.
3. Casting: Show representative texture, character style, spacing, finish, and method of attachment.
4. Exposed Accessories: Full-size Sample of each accessory type.
5. Full-size Samples will not be returned to Contractor for use in Project.

E. Product Schedule: For signs. Use same designations indicated on Drawings or specified.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Evaluation Reports: For post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

C. Sample Warranty: For special warranty.

D. Maintenance Data: For signage cleaning and maintenance requirements to include in maintenance manuals.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative of signage manufacturer for installation and maintenance of units required for this Project.

B. Source Limitations: Obtain each sign type through one source from a single manufacturer.

C. Regulatory Requirements: Comply with the Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.8 FIELD CONDITIONS

A. Field Measurements:

1. Verify locations of anchorage devices and electrical service embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.
2. Where dimensions of surfaces on which they are installed determine sizes of signs, verify dimensions by field measurement before fabrication and indicate measurements on Shop Drawings.

1.9 COORDINATION

A. For signs supported by or anchored to permanent construction, advise installers of anchorage devices about specific requirements for placement of anchorage devices and similar items to be used for attaching signs.

1. Do not install any building elements in conflict with signage, wall graphics or design feature locations. Such elements include but are not limited to conduit, signals, devices, pipes, fixtures and equipment.

2. The contractor is to review signage, graphic and interior elevation drawings, existing conditions prior to fabrication and installation to coordinate all building elements and associated conduit routes.

3. Any conflicts identified shall be submitted by RFI to the design team for review and further coordination.

4. Where conflicts are observed after installation, the building elements involved are to be relocated at the contractor’s expense.

5. For signs supported by or anchored to permanent construction, furnish templates for installation of anchorage devices.

6. Coordinate anchorage location and depth with precast concrete manufacturer.

B. Coordinate location of remote transformers with building construction. Ensure that transformers are accessible after completion of Work, however they shall not be visible from exterior.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal weathering.
b. Separation or delamination of sheet materials and components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.

B. Accessibility Standard: Comply with applicable provisions in the accessibility standards of the jurisdiction, ICC A117.1.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 GARAGE & E-BIKE FACILITY SIGNS

A. Garage Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Solid-Sheet Sign: Aluminum sheet with finish specified in "Surface Finish and Applied Graphics" Subparagraph and as follows:

a. Thickness: 0.080 inch with not less than the strength and durability properties specified in ASTM B209 for 5005-H15.
b. Sign background colors as noted in drawings shall be silk-screened over roller-applied reflective sheeting background, 3M Engineer Grade “Scotchlite” #7310 white reflective sheeting, or approved equal.

c. Reflective symbols and text shall be reverse-stenciled resulting from background color application over reflective sheeting.
d. Finished sign surface shall provide smooth and seamless interface between applied layers.
e. Alternative processes other than silk screening shall not be acceptable without prior approval from the Owner and Architect.

2. Sign Faces: Reflective sheeting shall be that required by Sections 633.05 and 718.01 of FHWA "Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects" FP-96.

3. Sign-Panel Perimeter: Finish edges smooth.

a. Edge Condition:

1) Vertical Edges: Square cut.
2) Horizontal Edges: Square cut.

b. Corner Condition in Elevation: As indicated on Drawings.

4. Mounting: As indicated on Drawings with.
5. Text and Typeface: As indicated on Drawings..
6. Flatness Tolerance: Sign is to remain flat or uniformly curved under installed conditions as indicated on Drawings and within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner.

B. Pedestrian Signs: See Signage General Notes and details as indicated on drawings.

C. Dimensional Letters: Cast aluminum characters and symbol of designs as indicated on drawings shall be provided by Spanjer Signs or Approved Equal.

D. Internally lit LED Channel Letters: 3/16-inch acrylic face in colors indicated on drawings. Prefinished 0.040-inch aluminum returns in color noted on drawings with high reflective white interior. Aluminum trim cap and back colors as indicated on drawings.

2.3 SIGN MATERIALS

A. Aluminum Sheet and Plate: ASTM B209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

B. Aluminum Extrusions: ASTM B221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

C. Reflective Sheeting: 3M Advanced Flexible Engineer Grade Reflective Sheeting Series 7300, permanent adhesive on back; roller applied as reflective sign background as indicated on Drawings and suitable for exterior applications.

D. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

E. Sign Supports: Structural Steel (ASTM A-36, galvanized), Aluminum or as indicated in drawings.

2.4 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following unless otherwise indicated:

1. For exterior exposure, furnish nonferrous-metal or hot-dip galvanized devices unless otherwise indicated.
2. Exposed Metal-Fastener Components, General:
   a. Fastener Heads: For nonstructural connections, where indicated, use flathead screws with tamper-resistant slots unless otherwise indicated.
3. Anchors and Inserts:
   a. Use galvanized steel expansion bolt devices for drilled-in-place anchors.
4. Sign Mounting Fasteners:
   a. Through Panel Fasteners: Exposed tamperproof metal fasteners with heads matching sign finish, , non-corrosive to sign material and mounting surface, and installed in predrilled holes.

B. Two-Face Tape: 3M Heavy Duty, Exterior Grade VHB Mounting Tape, acrylic foam-core, 0.045 inch thick, with adhesive on both sides.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.5 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
5. Internally brace signs for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.

6. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

B. Brackets and Frames: Fabricate brackets, frames, fittings, and hardware for signs to suit sign construction and mounting conditions indicated. Modify manufacturer's standard brackets as required.

2.6 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.

2.7 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Verify that electrical service is correctly sized and located to accommodate signs.

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

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.

2. Install signs so they do not protrude or obstruct according to the accessibility standard.
3. Install overhead signs so they do not encroach below the minimum required level clearances.
4. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
5. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Accessible Signage: Install in locations on walls as indicated on Drawings and according to the accessibility standard.

C. Mounting Methods:

1. Through Fasteners and Anchors: Drill holes in substrate using predrilled holes in sign as template. Install tamperproof through fasteners or anchors suitable for secure attachment to substrate as recommended by manufacturer’s written instructions.
2. Brackets: Remove loose debris from substrate surface and install bracket supports in position so that signage is correctly located and aligned.
3. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.

D. Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite side of glass to conceal back of sign and two-face tape.

E. Illuminated Characters and Signs:

1. Run wires into wall construction through conduit.
2. Exposed-to-view wiring or conduit on wall face is not permitted.
3. Engage a licensed electrician to connect wiring to power source.
4. All electrical supply components including but not limited to junction boxes, transformers and conduit are to be concealed and not visible from the building exterior.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101440

SECTION 102800 - TOILET ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Public-use Restroom accessories.
2. Warm-air dryers.
3. Underlavatory guards.

B. Related Sections:
1. Division 09 Section “Ceramic Tile”.
2. Division 09 Section “Gypsum Wall Board”.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:

1. Construction details and dimensions.
2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Material and finish descriptions.
4. Features that will be included for Project.
5. Manufacturer's warranty.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify products using designations indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.8 WARRANTY

A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.

B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.

C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inchminimum nominal thickness.

D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.

E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

I. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.2 PUBLIC-USE TOILET ROOM ACCESSORIES

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

B. Basis-of-Design Product: Bobrick Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. American Specialties, Inc.
2. Bradley Corporation.
3. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.Or Approved Equal.

C. Toilet Tissue (2 Roll) Dispenser :

1. Basis-of-Design Product: Bobrick TTD-60.
2. Description: Double roll dispenser .
3. Mounting: Recessed Surface mounted.
4. Operation: Extra roll shall automatically drop in place when bottom roll is depleted. Unit shall be equipped with two theft-resistant, heavy-duty, one-piece, molded ABS spindles.
5. Capacity: Designed for 5 1/4-inch- diameter tissue rolls.
6. Material and Finish: Stainless steel, No. 4 finish (satin) .

D. Automatic -Soap Dispenser :

1. Basis-of-Design Product: Gamco G-950SA.
2. Description: Designed for dispensing soap no touch, sensor operated, in liquid or lotion form.
3. Mounting: Vertically oriented, surface mounted.
4. Capacity: 30 oz..
5. Materials: Stainless steel with satin-finish.
6. Lockset: Tumbler type.
7. Refill Indicator: Window type.

E. Grab Bar as shown in toilet room elevations:

1. Basis-of-Design Product: Bobrick.
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch thick.

    a. Finish: Smooth, No. 4 finish (satin).

4. Outside Diameter: 1-1/2 inches.
5. Configuration and Length: As indicated on Drawings .

6. Basis-of-Design Product: Bobrick B-35745.
7. Mounting: Recessed] [Surface mounted].

8. Receptacle: Removable.
9. Material and Finish: Stainless steel, No. 4 finish (satin)

F. Mirror Unit :

1. Basis-of-Design Product: Bobrick B-165 2430.
2. Frame: Stainless-steel channel .

   a. Corners: Manufacturer's standard .

3. Size: 24x30 .

2.3 WARM-AIR DRYERS

A. Basis-of-Design Product: Bobrick B-750 :

1. A & J Washroom Accessories, Inc.

2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation.

5. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
6.

2.4 UNDERLAVATORY GUARDS

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

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Plumberex Specialty Products, Inc.
2. Truebro by IPS Corporation.
3. Or Approved Equal.

C. Underlavatory Guard :
1. Description: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
2. Material and Finish: Antimicrobial, molded plastic, white.

2.5 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories in accordance with The Americans with Disabilities Act Guidelines and 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.

B. Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set units level, plumb, and square at locations indicated, according to manufacturer's written instructions for substrate indicated.

C. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

D. Contractor to be responsible for all installations.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102800

SECTION 104416 - FIRE EXTINGUISHERS AND CABINETS

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 portable and wheeled fire extinguishers, cabinets and accessories including mounting brackets for fire extinguishers.

1.3 ACTION SUBMITTALS

A. Product Data:

1. For each type of fire extinguisher. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguishers and mounting brackets.
2. For each type of fire extinguisher cabinet. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing surface-mounting method and relationships of box and trim to surrounding construction.

B. Shop Drawings: For fire extinguisher cabinets. Include plans, elevations, sections, details, and attachments to other work.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire extinguishers and cabinets to include in maintenance manuals.

1.6 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire extinguisher 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. Failures include, but are not limited to, the following:

a. Failure of hydrostatic test according to NFPA 10 when testing interval required by NFPA 10 is within the warranty period.
b. Faulty operation of valves or release levers.

2. 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.

1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each cabinet and mounting bracket indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Amerex Corporation.
b. Ansul Incorporated.
c. Badger Fire Protection.
d. Buckeye Fire Equipment Company.
e. Fire End & Croker Corporation.
f. Guardian Fire Equipment, Inc.
g. JL Industries, Inc.; a division of the Activar Construction Products Group.
h. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
i. Larsens Manufacturing Company.
j. Moon American.
k. Nystrom Building Products.
l. Pem All Fire Extinguisher Corp.
m. Potter Roemer LLC.
n. Pyro-Chem; Tyco Safety Products.
o. Strike First Corporation of America.

2. Valves: Manufacturer's standard.
3. Handles and Levers: Manufacturer's standard.
4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.

B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4-A:60-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container at Electrical and Mechanical Rooms, Storage/Utility Rooms, Elevator Machine Room, Parking Office and other locations as indicated in the Drawings.

2.3 FIRE EXTINGUISHER CABINETS

A. Cabinet Type: Suitable for fire extinguisher.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Fire-End & Croker Corporation.
b. GMR International Equipment Corporation.
c. Guardian Fire Equipment, Inc.
d. JL Industries, Inc.; a division of the Activar Construction Products Group.
e. Larsens Manufacturing Company.
f. Modern Metal Products, Division of Technico Inc.
g. Nystrom, Inc.
h. Potter Roemer LLC.
i. Strike First Corporation of America.

B. Cabinet Construction: Nonrated.

C. Cabinet Material: Aluminum sheet.

D. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall with no trim.

E. Cabinet Trim Material: Extruded-aluminum shapes.

F. Door Material: Extruded-aluminum shapes.

G. Door Style: Center vision panel with frame.

H. Door Vision Panel: Clear UV stable acrylic panel.

I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide manufacturer's standard.
2. Provide manufacturer's standard hinge permitting door to open 180 degrees.

J. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Lettered Door Handle: One-piece, cast-iron door handle with the word "FIRE" embossed into face.
3. Door Lock: Cylinder lock, keyed alike to other cabinets. Basis of Design: JL INDUSTRIES SAF-T-LOK™.
4. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated.

    a. Identify fire extinguisher in cabinet with the words "FIRE EXTINGUISHER."

        1) Location: Applied to cabinet door.
        2) Application Process: Silk-screened.
        3) Lettering Color: Red.
        4) Orientation: Vertical.

5. Alarm: Manufacturer's standard alarm that actuates when fire extinguisher cabinet door is opened and that is powered by low voltage, complete with transformer.

K. Materials:

1. Aluminum: ASTM B 221, with strength and durability characteristics of not less than Alloy 6063-T5 for aluminum sheet. ASTM B 221 for extruded shapes.

    a. Finish: Baked enamel or powder coat.
    b. Color: As selected by Architect from full range of industry colors and color densities.

2. Tempered Break Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 1.5 mm thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Examine roughing-in for hose and cabinets to verify actual locations of piping connections before cabinet installation.

C. Examine walls and columns for suitable substrate conditions where cabinets will be installed.

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

3.2 INSTALLATION

A. General: Install fire extinguishers, cabinets and mounting brackets, and chain-link enclosures for wheeled fire extinguishers in locations indicated and in compliance with requirements of authorities having jurisdiction.
   1. Mounting Heights: 54 inches above finished floor to top of fire extinguisher cabinet. Use vertically oriented Unistrut to mount cabinet when the top of cabinet is higher than the mounting surface. Fire extinguisher handle mounting height must not exceed 48" A.F.F. in accordance with ADA requirements.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

3.3 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire extinguisher cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire extinguisher cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire extinguisher cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire extinguisher cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire extinguisher cabinet and mounting bracket manufacturers.

E. Replace fire extinguisher cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104416

SECTION 108500 – STAINLESS STEEL BIRD SPIKES

PART 1 – GENERAL

1.1 SUMMARY

A. Design Requirements: Select appropriate size as determined by site conditions to prevent birds from landing and roosting on specified surfaces.

1.2 QUALITY ASSURANCE

A. Single Source Responsibility: Furnish products from one manufacturer for the entire project.
B. Country of Origin: Country of Origin shall be designated at U.S.A.
C. Obtain all technical information from the manufacturer.
D. Utilize Bird·B·Gone Authorized Installers who are certified in Bird·B·Gone product installations. Proof of Certification required.
E. Installer shall visit the site to gather all the information on existing site conditions.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's descriptive literature and product specifications for each product including catalogs, installation instructions and other descriptive material.
B. Provide Warranty on material and installation.
C. Provide samples of each type of spike excluding proposed fastening methods.
D. Provide a statement by official indicating that they are a certified installation company.

1.4 PRODUCT HANDLING

A. Protect Bird·B·Gone products from damage before, during and after the installation.

1.5 PROJECT CONDITIONS

A. Coordination: Furnish samples of system(s) so installation can be coordinated with existing conditions and within on-site conditions.
B. Visit site and field-measure prior to fabrication and delivery of materials.

1.6 WARRANTY

A. Product shall carry a minimum 10-year guarantee against manufacturers' defects, U.V. breakdown and stainless steel degradation

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

Manufacturer:
Bird B Gone LLC
Bird Spike 2001 Stainless Steel
1921 E. Edinger Ave.
Santa Ana, CA 92705
Tel: 800-392-6915 or 949-472-3122
Fax: 949-472-3116
P.O.C.: Chris Fields

2.2 PRODUCT DESCRIPTION

A. Model Designation:
1. Bird·B·Gone Stainless Steel Bird Spikes™ - 1", 3", 5" or 8"
a. Width of Coverage:
i. BBG2001/1: 1" - 2" widths
ii. BBG2001/3: 2" - 4" widths
iii. BBG2001/5: 4" - 6" widths
iv. BBG2001/8: 7" - 9" widths
b. Maximum 40 spikes per foot in linear array with "no gap" center spike and non-staggered design.
c. Height: 4-3/4"
d. Base Strip: Flexible. Base can bend up to 360°
e. Length: 2 ft. sections
f. Patented "Bend & Crush" technique anchors steel spikes into base unit.
g. Spike thickness must be .05 thousands/1.1 mm diameter.
h. Packaging: 50 ft. per box. Twenty-five (25) 2 ft. sections per box.
i. Number of Rows: As determined by the manufacturer and based on project conditions.
j. Mounting System: As determined by the manufacturer and based on project conditions.

2.3 MATERIALS

A. Material: U.V. stabilized polycarbonate. Heat and weather resistant, (+310°F to –200°F) 304 stainless steel spikes (marine grade 316 stainless steel spikes available upon request).
B. Construction: Rigid one-piece construction.
C. Adaptation: Tin snips, hacksaw, etc. can be used to cut / adapt the product to desired length.

2.4 MOUNTING SYSTEMS

A. Wood: Use #8 wood screws. For every 2 ft. section of Bird·B·Gone Stainless Steel Spikes™, ten (10) #8 wood screws are required.
B. Steel, Brick, Stone or Concrete: Use an outdoor construction grade adhesive. Purchase from the manufacturer or call for recommended adhesives. If mounting surface warrants, screw or bolt down Bird·B·Gone Stainless Steel Spikes™ in conjunction with adhesive.
C. Pipes or Poles: Cable ties can be used alone or in conjunction with an outdoor construction grade adhesive. For U.V. protected cable ties, purchase directly from the manufacturer or call for recommended products.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine the installation area and note any detrimental or hazardous work conditions. Notify the contracting officer or inspector of the detrimental work conditions.
B. Do not proceed with installation until conditions are corrected.

3.2 SURFACE PREPARATION

A. Surface should be thoroughly cleaned and free of bird droppings, nesting materials, rust, peeling paint or other debris.
B. Remove or repair articles that may damage Bird·B·Gone Stainless Steel Spikes after installation, including overhanging foliage, brush and loose parts on the structure.

3.3 INSTALLATION

A. Install Bird·B·Gone Stainless Steel Spikes as recommended by the manufacturer.
B. Bird·B·Gone Stainless Steel Spikes should be installed correctly, covering the entire depth of the surface, not just the perimeter.
   1. Follow the contours and angles closely; cut or break away to fit properly.
   2. Space materials in accordance with manufacturer’s recommendations.

3.4 INSPECTION

A. Visually inspect Bird·B·Gone Stainless Steel Spikes for any signs of poor installation, including loose screws, fasteners and un-removed debris.
B. Immediately correct and repair as necessary.

END OF SECTION 108500

SECTION 108501 – BIRD SLOPE

1.1 SUMMARY

A. Design Requirements: Select an appropriate size and system as determined by site conditions to prevent birds from landing and roosting on specified surfaces.

1.2 QUALITY ASSURANCE

A. Single Source Responsibility: Furnish products from one manufacturer for the entire project.
B. Country of Origin: Country of Origin shall be designated at U.S.A.
C. Obtain all technical information from the manufacturer.
D. Utilize labor or Bird·B·Gone® Authorized Installers who are knowledgeable in Bird·B·Gone product installations.
E. Installer shall visit the site to gather all information on existing site conditions.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's descriptive literature and product specifications for each product including catalogs, installation instructions and other descriptive material.
B. Provide Warranty on Material and Installation.
C. Provide Samples of Bird Slope excluding proposed fastening methods.
D. Provide statement by officials indicating that they are a certified installation company.

1.4 PRODUCT HANDLING

A. Protect Bird·B·Gone products from damage before, during and after the installation.

1.5 PROJECT CONDITIONS

A. Coordination: Furnish samples of system(s) so installation can be coordinated with existing conditions and within on-site conditions.
B. Visit site and field measure prior to fabrication and delivery of materials.

1.6 WARRANTY

A. Product shall carry a minimum 2-year guarantee against U.V. breakdown.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

Manufacturer:
Bird B Gone LLC

Bird Slope™

1921 E. Edinger Ave.
Santa Ana, CA 92705
Tel: 800-392-6915 or 949-472-3122

Fax: 949-472-3116

P.O.C.: Chris Fields

2.2 PRODUCT DESCRIPTION

A. Model Designation:
   1. BIRD SLOPE™
      a. Width of Coverage: 5.5 inches
      b. Length: 4 ft. sections
      c. Packaging: 48ft. per box. (12) 4ft. sections per box.
      d. Colors: Grey or Stone. Can be painted to match desired color.
      e. Width of Coverage with Extender: 10 inches
      f. Length of Extender: 4 ft. sections
      g. End Caps: Use to close off ends of installations as necessary.
      h. Mounting System: As determined by the manufacturer and based on project conditions.
B. Product made in the U.S.A.

2.3 MATERIALS

A. Material: U.V. protected outdoor grade PVC plastic (sun & weather resistant).
B. Construction: Rigid one-piece construction.
C. Adaptation: Cut to desired width / length using tablesaw, hacksaw or tin snips.

2.4 MOUNTING SYSTEMS

A. Use an outdoor construction adhesive that is not silicone based. Purchase from the manufacturer or call for recommended adhesives.
B. For under eave installations use Bird Slope Mounting Clips.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine the installation area and note any detrimental or hazardous work conditions. Notify the contracting officer or inspector of the detrimental work conditions.
B. Do not proceed with installation until conditions are corrected.

3.2 SURFACE PREPARATION

A. Surface should be thoroughly cleaned and free of bird droppings, nesting materials, rust, peeling paint or other debris.
B. Remove or repair articles that may damage Bird Slope™ after installation, including overhanging foliage, brush and loose parts on the structure.

3.3 INSTALLATION

A. Install Bird Slope™ as recommended by the manufacturer.
B. Bird Slope™ should be installed correctly, covering the entire depth of the surface.
    1. Follow the contours and angles closely.
    2. Space materials in accordance with manufacturer's recommendations.
    3. Use End Caps to close off where necessary.

3.4 INSPECTION

A. Visually inspect Bird Slope™ for any signs of poor installation, including loose fasteners and un-removed debris.
B. Immediately correct and repair as necessary.

END OF SPECIFICATONS

SECTION 133100 – TENSILE MEMBRANE STRUCTURES

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 the work of this section.

1.2 SUMMARY

A. This section includes an exterior architectural graphic tensile membrane art facade structure system.

B. The tensile membrane structure contractor (hereafter referred to as "Subcontractor") shall be responsible for the structural design, detailing, fabrication, supply, and installation of the work specified herein, some or all of which may be contracted by Subcontractor to others meeting the qualification requirements of Section 1.5. The intent of this specification is to establish in the first instance an undivided, single-source responsibility of the Subcontractor for all of the foregoing functions.

C. Subcontractor's work shall include, but not necessarily be limited to, the structural design, supply, fabrication, shipment, and erection of the following principal items:
   1. The architectural membrane as indicated on the drawings and in these specifications.
   2. Cables and end fittings.
   3. Perimeter, catenary, and sectionalized aluminum clamping system.
   4. Structural steel, including masts, trusses, struts, beams, and / or weldments, as indicated on the drawings.
   5. Fasteners and gasketing.

D. The architectural mesh membrane used in these structures shall be polyvinylchloride (PVC). All references to "membrane" in this Section, without exception, and whether singular, plural, or capitalized or not, are to such architectural membrane.

E. Related Sections:
   1. 033000 – Cast-In-Place Concrete.
   2. 034000 – Precast Concrete

1.3 REFERENCES

A. General: Except as otherwise shown or noted, all work shall comply with the requirements of the following codes and standards:
   1. American Institute of Steel Construction (AISC).

a. Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings
b. Code of Standard Practice for Steel Buildings and Bridges
c. Specification for Structural Steel Buildings – Allowable Stress Design and Plastic Design
d. Specification for Allowable Stress Design of Single-Angle Members
e. Seismic Provisions for Structural Steel Buildings

2. American Society of Civil Engineers (ASCE)
   a. ASCE 19: Structural Applications of Steel Cables for Buildings
   b. ASCE 7: Minimum Design Loads for Buildings and Other Structures
3. America Society of Testing and Materials (ASTM)
   a. ASTM A 586: Standard Specification for Zinc-Coated Steel Structural Strand
   b. ASTM A 603: Standard Specification for Zinc-Coated Steel Structural Wire Rope
   c. ASTM A 780: Zinc Rich Paint Repairs
   d. ASTM A 153: Hot Dip Galvanizing
   e. ASTM E 84: Standard Test Methods for Coated Fabrics and Laminates
   f. ASTM A 36: Carbon Steel
   g. ASTM A 307: Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
   h. ASTM E 84: Standard Test Method and Surface Burning Characteristics of Building Materials
   i. ASTM D 1117: Testing Non-Woven Fabrics
   j. ASTM B 221-08: Standard Aluminum and Aluminum Alloy Extruded Bars
   k. ASTM B 209: Standard Specification for Aluminum Sheet
4. America Welding Society (AWS)
   a. AWS D1.1: Structural Welding Code
   b. AWS 2.4: Symbols for Welding and Nondestructive Testing
5. National Fire Protection Association (NFPA)
   a. NFPA 701: Standard Methods of Fire Tests for Flame Propagation of Textiles and Films
6. Steel Structures Painting Council (SSPC)
   a. Steel Structures Painting Manual, Volumes 1 and 2

1.4 SYSTEM REQUIREMENTS

A. General: Provide a structural tensile membrane system that complies with requirements specified herein by testing the Subcontractor's corresponding membrane system in accordance with the indicated test methods.

B. Building Code Criteria: The tensile membrane structure shall comply with the 2020 Building Code of New York State. (To be Coordinated with EOR)

*****PLEASE NOTE ALL BELOW ITEMS ARE TO MEET 2020 BUILDING CODE OF NEW YORK STATE STANDARDS*****

- Ground Snow Load:
- Snow Load Importance Factor:
- Roof Live Load:
- Basic Wind Speed:
- Wind Load Importance Factor:
- Wind Exposure Category:
- Seismic Use Group:
- Seismic Importance Factor:
- Mapped Spectral Response Acceleration at Short Periods, Ss:
- Mapped Spectral Response Acceleration at 1-Second Period, S1:
- Seismic Site Class:
- Damped Spectral Response Coefficient at Short Periods, Sds:
- Seismic Design Category:

C. Life Safety: All tensile membrane structures shall be detailed so that no life safety issue is created in the event of a loss of a part of the membrane. The tensile membrane structure shall not rely on the membrane for structural stability.

D. Fire Performance: Range of characteristics required of membranes:
   1. Burning Characteristics (NFPA 701)
      a. Flame Spread (After Flame) Class C PASS
      b. Flame Spread (Residual Flame) Class C PASS
      c. Char length Class C PASS
   2. Fire Resistance of Roof Coverings (ASTM E 84)

1.5 QUALITY ASSURANCE

A. Subcontractor Qualifications: Fabrication and erection of the tensile membrane structure is limited to firms with proven experience in fabrication and construction of complex tensile membrane structures. Such firms, through their own experience and/or that of their qualified subcontractors, shall meet the following minimum requirements:
   1. The Subcontractor shall have at least ten (10) years' experience in the successful fabrication and erection of permanent, custom tensile mesh membrane structures.
   2. The Subcontractor shall have fabricated and erected at least twenty (20) PVC/PVDF-coated woven fiberglass tensile mesh membrane structures, with at least five (5) structures of similar size and complexity as this project.
   3. Demonstrate it has maintained an in-house professional engineering design staff for at least ten (10) years and will provide final engineering drawings that have been prepared by licensed Professional Engineers in its employ.
   4. The Subcontractor shall demonstrate it has a fabrication facility of adequate capacity and a staff experienced in the fabrication of PVC/PVDF-Coated polyester tensile mesh membrane structures that will undertake the fabrication of this project.
   5. The Subcontractor shall submit a Corporate Quality Control Manual describing the company's complete quality assurance program.

6. All bidders shall be able to provide proof with their bid of a minimum of $2,000,000 general/public liability insurance, $3,000,000 professional liability (PL) insurance and additional $10,000,000 umbrella/excess liability insurance.

1.6 SUBMITTALS

A. Submit under provision of Section 013300 – Submittal Procedures.

B. General: Not withstanding any provisions of these specifications that may appear to be to the contrary, any and all submittals by the Subcontractor shall be subject to review, approval, and adoption by the Architect/Engineer as part of the overall project design and engineering and shall not create a contractual or other professional design relationship between the Subcontractor and either the Architect/Engineer or the Owner.

C. Product Data: Include manufacturer's specifications for materials, fabrication, installation, and recommendations for maintenance. Include test reports showing compliance with project requirements where test method is indicated.
Sample: Submit selection and verification samples.

D. Design Drawings: Subcontractor shall submit tensile membrane structure drawings defining the completed structure, anchorage, and connection details, interfaces with building construction and general membrane seam arrangements. Design Drawings are to be signed and sealed by a Structural Engineer in the State of New York.

E. Design Calculations: Subcontractor shall submit complete calculations for the tensile membrane structure, as one package with the design drawings, signed and sealed by a Structural Engineer licensed in the State of New York. Structural calculations shall include all required loading cases and load combinations used in the design and resulting member forces, reactions, deflections and drift. The magnitude of maximum reactions on the supporting structures from all critical load combinations shall be separately tabulated. Critical load conditions used in the final sizing of the members shall be emphasized. The design analysis shall include the name and office phone number of the designer to answer questions during the design drawing review.

G. See Section – 17000 – Close-out Procedures: Submit the following items:
1. Warranty: Project Warranty documents as described herein.
2. Record Documents: Project record documents for installed materials in accordance with Contract Conditions and Division 1 Submittal Procedures Section.
3. Maintenance Manual: Submit one (1) copy of a maintenance manual for the tensile membrane structure to the owner. The manual shall include a schedule for routine inspection, and inspection checklist, instructions for emergency repair and use of emergency repair materials, and warranty. During the system erection period, the owner shall provide maintenance personnel to be trained in the se of repair materials.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

A. See Section – 016000 – Product Requirements.

B. Materials shall be packed, loaded, shipped, unloaded, stored, and protected in a manner that will avoid abuse, damage, and defacement.

1.8 WARRANTY

A. The Subcontractor shall furnish the Owner with a written warranty, which warrants the membrane, its perimeter attachment system, and the structural support system as supplied by the Subcontractor have been installed in accordance with the project specifications and will be free from defects in materials and workmanship that will impair their normal use of service. The warranty shall start from the date of substantial completion of the tensile membrane structure, which shall be the first date on which the entire tensile membrane structure is subject to design pre-stress conditions.

B. One (1) year workmanship warranty on installed products
One (1) year structural warranty on structural steel and cables
One (1) year warranty on paint system
Manufacturer's standard pass thru warranty on fabric

PART 2 – MATERIALS

2.1 QUALIFIED CONTRACTOR

A. *FabriTec Structures LLC (dba PFEIFER Structures America)*
ATTN: Peter Katcha
1011 Regal Row
Dallas, TX 75247
Tel: 469-670-4104
EMAIL: peter.katcha@pfeifer-structures.com

B. *Texclad*
ATTN: Paul Britten
Traverse City, MI
Tel: 855-763-8205
texclad@britteninc.com

C. Or approved equal. Substitution requests must be submitted by a prime bidder a minimum of ten (10) days prior to bid date. Any approved equals shall be issued by addendum only, prior to the bid date.

D. Approved bidders must meet all qualifications in Section 1.5 – Quality Assurance and show written proof for each item listed to become an approved equal.

2.2 ARCHITECTURAL MEMBRANE

A. General: The mesh membrane used in these structures shall be polyvinylchloride (PVC) with Polyvinylidene Difluoride (PVDF) top surface coating. All references to "membrane" in this section, without exception, and whether singular, plural, or capitalized or not, are to such architectural membrane.

B. The membrane shall meet the following general requirements:
   1. Source Quality Control: The primary materials shall be obtained from a single manufacturer. Secondary materials shall be those recommended by the primary manufacturer.
   2. Physical Characteristics: The following indicates a range of physical property types for PVC/PVDF architectural membranes. The determination of specific characteristics and selection of a membrane shall be derived from analysis and calculations carried out by the Professional Engineer for this project.

a.	Construction: Polyester blended	PVC/PVDF top coated with a PVC/PVDF bottom side
b.	Coated Fabric Weight (oz./sq.yd): (ASTM D 751-00)	22-24 11-12 oz. per sq yd
c.	Thickness (mils) (ASTM D 751-00)	20-45 16-18 nom.
d.	Strip Tensile (lbs./1.968 inch, avg.)	
	1) Dry, Warp (ASTM D 751-00)	323-1,250 517-697 min. avg.
	2) Dry, Fill (ASTM D 751-00)	310-950 360-472 min. avg.
e.	Trapezoidal Tear (lbs./1.968 avg.)	
	1) Dry, Warp (ASTM D 751-00)	40-240 90-101 min. – 95 min. avg.
	2) Dry, Fill (ASTM 4851)	30-200 45 min. – 120 min. avg.
f.	Solar Transmission (%) (ASTM 424)	6 – 14 nom.
g.	Solar Reflectance (%) (ASTM 424)	70 – 78 nom.
h.	Flame Retardancy (NFPA 701)	Complies – Small Scale
i.	Color:	White

C. Materials base fabric and coatings:
   1. Yarns: The yarns used in the base fabric shall be high tenacity polyester of the highest commercial quality, essentially free of broken fibers after the weaving process, and fully

suitable for coating. The fabric shall be woven with uniform tension and crimp in the warp and fill yarns and free of defects deleterious to the coating process. The base fabric shall be of sufficient width to allow for finished coated goods of at least 70 inches.

2. Weave: The weave shall be plain weave, panama weave, or malimou weave. The weave shall be uniform, with the warp and fill at right angles to each other with a tolerance of 5 degrees. The bow in the fill direction shall not exceed 1 inch or 1 in 30 offset to width over length.
3. PVC Coating: After weaving, the base fabric shall be cleaned and primed to achieve optimum mechanical properties of the coated fabric. The PVC coating shall consist of new PVC resin, plasticizers, UV inhibitors, mold inhibitors, flame retarding agents, and extenders. These materials shall be applied to form a weatherized barrier between the polyester yarns and the environment. The formulation shall be demonstrated to have given satisfactory performance in the past with regard to flexibility in handling, adhesion, and durability in use. The coating shall be applied evenly to both sides of the fabric and shall be of sufficient thickness to permit proper high frequency (HF) welding of joints.
4. Top Coating: To achieve a completely uniform surface with no discontinuities, spots, or lumps that would be objectionable to the unaided eye from a distance of fifteen (15) feet, either one of the following surface-top and bottom coats, PVC-coated polyester architectural mesh fabrics may be supplied:
   a. PVDF Topcoat: Shall have a non-weldable grafted Kynar® (i.e. polyvinylidene fluoride or PVDF) surface topcoat.
   b. Weldable: PVC / PVDF blended topcoat. **(Use only for S top)**

E. Product Substitutions: No substitutions will be permitted.

2.3 CABLE AND END FITTINGS

A. Materials
   1. All structural wire rope cables shall conform to the latest revision of ASTM A 603.
   2. All structural strand cables shall conform to the latest revision of ASTM A 586.
   3. All cables shall be coated to “Class A” zinc coating throughout.

B. Fabrication
   1. Cable fabricator shall provide effective quality control over all fabrication activities. Inspection of the place of fabrication may occur at any time to verify proper quality control. This inspection does not relieve the fabricator from meeting the requirements of this specification.
   2. Cables that are designated to be pre-stretched shall be pre-stretched per ASTM A 603 for wire rope and ASTM A 586 for structural strand. Cables of the same type shall have the same modulus of elasticity.
   3. All cables shall be manufactured to the following length tolerances at 70° Fahrenheit (23° Celsius):
      a. Length < 70 feet (213 meters) ¼ inch (6.4mm)

b. Length 70 to 270 feet (32.3 to 82.3 meters) 0.03% of length
c. Length > 270 feet (82.3 meters) 1 inch (25.4 mm)

4. Cables shall have a continuous longitudinal paint stripe (1/8 inch wide max.) along their top surface unless noted otherwise.
5. Index markings shown shall be a circumferential paint stripe (1/8 inch wide max.).
6. All cables and end fittings shall be delivered clean and dry.
7. All swaged and speltered fittings shall be designed and attached to develop the full breaking strength of the cable. Thimble end fittings shall develop a minimum of 90 percent of the cable breaking strength.
8. Swaged end fittings, pins, nuts, and washers shall be electro-galvanized. Any damage to the zinc coating shall be cleaned and painted with gray zinc-rich paint per ASTM A 780.
9. Speltered end fittings shall be hot dip galvanized per ASTM A 153. Any damage to the zinc coating shall be cleaned and painted with a gray zinc-rich paint per ASTM A 780.

2.4 ALUMINUM CLAMPING SYSTEM

A. Materials
1. All structural aluminum clamping systems shall be ASTM alloy 6061-T6.
2. Bent Plates shall be formed from ASTM B 221-08 alloy 6061 and then heat-treated to T6.
3. All structural “U straps” shall be ASTM B 221-08 Aluminum Alloy 6063, heat-treated to T5.
4. All structural aluminum clamping shall have the following finish:
   a. Polyester thermosetting powder coating with a tri-glycidyl di-isocyanurate (i.e. TGDI) curing agent/hardener per American Architectural Manufacturers Association (AAMA) 603 to a thickness of 3 mils, whit in color

   OR

   b. Clear anodized per MIL-A 8625C, Type 2, Class 1.
5. Structural sheet aluminum shall be ASTM B 209 alloy 5052-H32.
6. Non-structural sheet aluminum shall be ASTM B 209 alloy 1100 series.

B. Fabrication
1. Aluminum fabricator shall provide effective quality control over all fabrication activities. Inspection of the place of fabrication may occur any time to verify proper quality control. This inspection does not relieve the fabricator from meeting requirements of this specification.
2. Fabricated aluminum shall have no sharp edges.
3. Stamp all parts with the appropriate mark number.
4. All fabricated aluminum shall be free of oil, grease, and machining chips.
5. Tolerances shall be as follows:
   a. Cross sectional dimensions +/- 10%, 0.03 in. (0.8 mm) max.
   b. Bolt hold locations +/- 1/32 in. (0.8 mm)
   c. Overall length +/- 1/16 in. (1.6 mm)
6. All welded joints shall conform to AWS D1.2.

2.5 STRUCTURAL STEEL

A. General: The structural steel fabrication shall comply with the latest revision of all applicable codes, standards and regulations including the following:
   1. ASTM (as referenced)
   2. AISC: “Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings” and “Code of Standard Practice for Steel Buildings and Bridges”
   3. SSPC: “Steel Structures Painting Manual, Volumes 1 and 2”
   4. Research Council on Riveted and Bolted Structural Joints: “Specification for Structural Joints Using ASTM A 325 or A 490 Bolts”
   5. AWS D1.1 and AWS A2.4

B. In the event of conflict between pertinent codes and regulations and the requirements of the reference’s standards or these specifications, the provisions of the more stringent shall govern.

C. Submittals
   1. General: Submit the following under provisions of Section 013300 – Submittal Procedures.
   2. Shop Drawings:
      a. The structural steel fabricator shall submit shop drawings to the Subcontractor for approval.
      b. The drawings shall show all shop and erection details including cuts, copes, connection holes, threaded fasteners, bolts, stands and spacing, etc.
      c. The drawings shall show all welds, both shop and field, by the currently recommended symbols of the AWS.
      d. A welding procedure must be submitted to the Subcontractor for approval of welds that are not pre-qualified.
      e. Shop drawings shall be carefully checked before being submitted for approval, and shall be submitted in the order in which they are needed for the executive of the work, well in advance and not all at one time. Submitted drawings shall show all structural steel required for the work, whether or not indicated on the drawings.
      f. The fabricator shall not fabricate any material until after receipt of approved shop drawings.
      g. The fabricator shall immediately make all corrections to his drawings as required by the Subcontractor and shall keep a satisfactory history of all changes by separately numbered and dated revision block on a convenient portion of each drawing affected.
      h. Certification of material conformance that includes chemical and physical properties for all structural elements shall be submitted to the Subcontractor.

D. Materials
   1. Structural steel for plates and bars shall conform to the requirements of ASTM A 36 or ASTM A 572, Grade 50, unless noted otherwise.

2. Structural pipe shall conform to ASTM A 53, Types E or S, Grade B.
3. Structural tubing shall conform to ASTM A 50, Grade B or C.
4. Structural bolts
   a. High strength bolts: ASTM A 325, unless noted otherwise
   b. Common bolts and nuts: ASTM A 307
   c. Threaded rods: ASTM A 36, unless noted otherwise
5. Other materials: All other materials, not specifically described but required for a complete and proper installation of structural steel, shall be provided and shall be new, free from rust, first quality of their respective kinds, and subject to the approval of the Subcontractor.

F. Fabrication
   1. Workmanship: All members when finished shall be true and free of twists, bends, and open joints between the component's parts. Members shall be thoroughly straightened in the shop by methods that will not injure them, before being worked on in any way.
      a. Properly mark materials, and match-mark when directed by the Subcontractor, for field assembly.
   2. Connections:
      a. Connections shall be as indicated on the drawings. When details are not shown the connections shall conform to the requirements of the AISC.
      b. Provide high strength threaded fasteners for all structural steel bolted connections, unless noted otherwise.
      c. Combination of bolts and welds in the same connection are not permitted, unless otherwise detailed.
      d. Welded Connections
         1) Definitions: All terms herein relating to the welds, welding and oxygen cutting shall be construed in accordance with the latest revision of "Standard Definitions of Welding Terms and Master Chart of Welding Processes" of the AWS.
         2) Operators: only operators who have been previously qualified by tests, as prescribed in AWS D1.1 to perform the type of work required shall make Welds.
         3) Welding equipment shall be of sufficient capacity and maintained in good working condition, capable of adjustment in full range of current settings. Welding cables shall be adequate size for the currents involved and ground methods shall be such as to insure proper machine operation.
         4) No welding shall begin until joint elements are clamped in proper alignment and adjusted to dimensions shown on the drawings and allowance for any weld shrinkage that is expected. No members are to be spliced without prior approval.
         5) All welding shall be done in accordance with the reference specifications, with the following modifications and additions:
            a) All field welding shall be done by manual shielded metal-arc welding.
            b) All groove welds shall have complete penetration, unless otherwise specified on the drawings.

c) The minimum preheat and inter-pass temperature requirements shall be as required per AWS D1.1.

6) Welding Sequence: Heavy sections and those having a high degree of restraint must be welded in a sequence with the proper preheat and post-weld heat treatment such that no permanent distortion occurs. Submit a welding sequence for approval for these types of connections.

7) Oxygen Cutting: Manual oxygen cutting shall be done only with a mechanically guided torch. Alternatively, an unguided torch may be used provided the cut is not within ½ inch of the finished dimension and the final removal is completed by chipping or grinding to produce a surface quality equal to that of the base metal edges. The use of oxygen-cut holes for bolted connections will under no circumstances be permitted and violation of this clause will be sufficient cause for the rejection of any pieces in which oxygen-cut holes exist.

3. Tolerances: All tolerances shall be as per the AISC "Code of Standard Practice for Steel Buildings and Bridges".
4. Paint System, Two-Part:
   a. Source Quality Control: Primary materials shall be obtained from a single manufacturer. Second materials shall be those recommended by the primary manufacturer.
   b. Surface Preparation and Base Coat
      1) The surface shall be commercial blast cleaned in conformance with SSPC-SP10/NANCE 2, after all fabrication operations such as machining and welding are completed. There shall be no more than an eight hour time lapse between the surface preparation and the application of the primate coat.
      2) The base coat shall be Sherman Williams Macropoxy 646 PW color mil white or light blue or approved equal, and shall conform to SSPC-Paint 22.
      3) The base coat shall be mixed and applied in accordance with the manufacturer's instructions and shall meet the requirements of SSPC Paint Specification No. 22. The minimum thickness shall be 2.0 to 4.0 mils dft.
   c. Finish Coat
      1) The finish coat shall be Sherman Williams Hi-Solid Polyurethane (semi-gloss) or approved equal, and shall conform to SSPC-paint number 36, level 3.
      2) The finish coat shall be mixed and applied in accordance with the manufacturer's instructions and the minimum thickness shall be 3.0 to 4.0 mils dft.
   d. Two-Part System Thickness: The minimum system thickness shall be 8.0 mils dft.
   e. Color: The paint color shall be as selected by the Architect
   f. Finish Quality: The dry paint shall be uniform and continuous with no voids or puddles and shall not be broken by scratches or nicks. Although the Subcontractor's Quality Assurance personnel may witness the painting operation, this does not relieve the painting subcontractor of the responsibility for meeting the quality and workmanship requirements of these specifications.
   g. Care and Handling: The painting subcontractor shall make every reasonable effort to ensure that the painted steel is thoroughly dry and that it is handled carefully to

prevent damage to the paint and to reduce field repairs. Nylon slings should be used when handling the painted steel.

h. Certification: The painting subcontractor shall be required to certify the paint manufacturer's name, paint identification, conformance with manufacturer's written instructions and the paint dry mil thickness.

G. Source Quality Control:
   1. Testing
      a. An independent testing laboratory paid for by the owner shall perform testing and inspection of the structural steel and welding. All welds shall be tested by visual, dye penetrant, magnetic particle methods in accordance with instructions from the Subcontractor.
      b. The Subcontractor and the testing laboratory inspector shall be permitted to inspect the work in the shop or field throughout fabrication and erection.
      c. The inspector shall check for workmanship of steel, both in the shop and field, and check general compliance with the contract documents and steel shop drawings. The inspector shall record types and locations of all defects found in the work and measures required and performed to correct such defects.
      d. The steel fabricator shall make all repairs to defective work to the satisfaction of the inspector and at no additional cost to the Subcontractor.
      e. The inspector shall submit reports of his inspection and test findings to the Subcontractor. He shall record all defects found with the subsequent repair operations and submit reports to the Subcontractor.
      f. The work of the independent inspector shall in no way relieve the steel fabricator of his responsibility to comply with all requirements of the contract documents.

H. Product Handling and Protection: Use all means necessary to protect structural steel before, during, and after installation, and to protect the installed work and materials of all other trades.

I. Rejection and Replacement:
   1. In the event of damage to the steel, immediately make all repairs and replacements necessary to the approval of, and at no additional cost, to the Subcontractor.
   2. Any materials or welding rejected through inspection either in the shop, mill, or field must be promptly replaced to the satisfaction of, and at no additional cost to, the Subcontractor.

J. Qualifications of Steel Fabricator: The steel fabricator shall have not less than five (5) years continuous experience in the fabrication of structural steel.

2.6 FASTENERS

A. General: Provide fasteners used to secure clamp systems to curbs and cables, assemblage of clamp systems, and other fasteners as required to complete the work specified herein.

B. Materials:
   1. All work shall comply with the latest edition of ASTM standards and American Iron and Steel Institute (AISI), as referenced herein.
   2. Fasteners used in membrane clamping systems shall be stainless steel. Bolts and studs shall conform to ASTM F 593, type 304. Nuts shall conform to ASTM F 594, Type 316. Washers shall be plain, narrow, and conform to AISI Type 18-8.
   3. All clamping systems subjected to relative movement between clamping and curb shall receive a split-ring lock washer conforming to AISI Type 18-8.
   4. Unless otherwise specified on the drawings, all other bolts and nuts shall conform to ASTM A 307-76B, zinc plated to conform to ASTM B 633 Class FE/ZN 8 type III.

C. Source Quality Control: The manufacturer shall certify that all fasteners comply with the above referenced specifications.

PART 3 – FABRICATION AND ERECTION

3.1 FABRICATION OF MEMBRANE PANELS

A. General
   1. Membrane assembly design drawings shall include all information necessary for the fabrication by the Subcontractor of the tensile membrane structure. They shall include size and shape of envelope, type, and location of shop and field connections, size, type and extent of all radio / high frequency (RF/HF) seams.
   2. The Subcontractor shall take necessary care to plan and assemble the fabricated sections such that the assembly has not shop patches. Splices, if any, shall be patterned into a symmetrical and repetitive geometric arrangement within the assembly, shown on the design drawings and, where feasible, hidden by structural members.
   3. All fabricated joints shall have a minimum of 90 percent of the total strength of the coated membrane in strip tensile testing. All structural joints shall be fused in accordance with industry standards and shall maintain the integrity of the coating. PVC/PVDF-coated polyester membranes shall be RF/HF seamed only.

3.2 ERECTION OF MEMBRANE ASSEMBLIES

A. Prior installation of the membrane assemblies, the Subcontractor shall meet with the General Contractor to review the erection procedure and scheduling. The Subcontractor shall coordinate all work with other trades.

B. No trade shall have access to, or work from the membrane, unless authorized by the Subcontractor in writing.

C. Erection of structural steel
   1. The Subcontractor shall employ a competent foreman to supervise all work of steel erection. This foreman shall be present at all times during the Subcontractor's scope of work.
   2. All precautions shall be taken to ensure an accurately located and completely safe and stable structure at all times. Adequate guy cables shall be used throughout the work and all erection bolts shall be drawn up tight.
   3. All steel shall be accurately aligned before permanent connections are made.
   4. Temporary bracing shall be left in place as long as may be required for safety. The bracing shall be located so it does not interfere with the erection for the tensile membrane structure, and can be removed as required during construction.
      a. The structure is to be self-supporting and stable after the structure is fully completed. It is the Subcontractor's sole responsibility to determine the erection procedure and sequence and to ensure the safety of the structure and its component parts during erection. This includes the additional of whatever temporary bracing, guys or tie-downs that may be necessary. Such materials shall be removed by the Subcontractor and remain his property after completion of the property.
   5. Erection tolerances shall be specified in the AISC "Code of Standard Practice for Steel Buildings and Bridges", unless otherwise noted.

3.3 CLEANING

A. Protect work from damage and deterioration during installation.

B. Upon completion of tensile membrane structure installation:
   1. The Subcontractor shall clean all surfaces of the system's components in conformance with the membrane manufacturer's recommendations.
   2. Inspect the system and repair membrane panels that become damaged. Repairs shall be executed in such a way that they are visually acceptable.

C. Steel Cleaning:
   1. Cleaning and touchup steel finishes field welds, bolted connections and abraded areas shall be completed per the manufacturer's field repair recommendations.

END OF SECTION 133100

SECTION 142123.16 - MACHINE ROOM-LESS ELECTRIC TRACTION PASSENGER ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Machine-room-less electric traction elevators.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for temporary use of elevators for construction purposes.
2. Section 033000 "Cast-in-Place Concrete" for setting sleeves, inserts, and anchoring devices in concrete.
3. Section 042000 "Unit Masonry" for setting sleeves, inserts, and anchoring devices in masonry and for grouting elevator entrance frames installed in masonry walls.
4. Section 055000 "Metal Fabrications" for the following:
    a. Attachment plates and angle brackets for supporting guide-rail brackets.
    b. Hoist beams.
    c. Structural-steel shapes for subsills.
    d. Pit ladders.
    e. Cants made from steel sheet in hoistways.
5. Section 096519 Resilient Tile Flooring for finish flooring in elevator cars.
6. Section 099124 "Interior Painting" for field painting of hoistway entrance doors and frames.
7. Section 221429 "Sump Pumps" for sump pumps, sumps, and sump covers in elevator pits.
8. Section 271513 "Communications Copper Horizontal Cabling" for twisted pair cable for telephone service for elevators and for connection to elevator controllers for remote monitoring of elevator performance.
9. Refer to Fire Alarm drawings for smoke detectors in elevator lobbies to initiate emergency recall operation and for connection to elevator controllers.

1.2 DEFINITIONS

A. Definitions in ASME A17.1/CSA B44 apply to work of this Section.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Machine-room-less electric traction elevators.

B. Product Data Submittals: For each product.

1. Include capacities, sizes, performances, operations, safety features, finishes, and similar information.
2. Include Product Data for car enclosures, hoistway entrances, and operation, control, and signal systems.

C. Shop Drawings:

1. Include plans, elevations, sections, and large-scale details indicating service at each landing, coordination with building structure, relationships with other construction, and locations of equipment.
2. Include large-scale layout of car-control station.
3. Indicate maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.

D. Samples for Initial Selection: For each type of exposed finish involving color selection.

E. Samples for Verification: For exposed car, hoistway door and frame, and signal equipment finishes; 3-inch- square Samples of sheet materials; and 4-inch lengths of running trim members.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Seismic Qualification Certificates: For elevator equipment, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway and pit layout and dimensions, as indicated on Drawings, and electrical service, as shown and specified, are adequate for elevator system being provided.

D. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.

1. Submit manufacturer's or Installer's standard operation and maintenance manual, in accordance with ASME A17.1/CSA B44 including diagnostic and repair information available to manufacturer's and Installer's maintenance personnel.

B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.

C. Continuing Maintenance Proposal:

1. Submit a continuing maintenance proposal from Installer to Owner, in the form of a standard one-year maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.
2. Submit a continuing maintenance proposal from Installer to Owner with terms, conditions, and obligations as set forth in, and in same form as, a "Draft of Elevator Maintenance Agreement" at end of this Section, starting on date initial maintenance service is concluded.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Elevator manufacturer or an authorized representative who is trained and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials, components, and equipment in manufacturer's protective packaging. Store materials, components, and equipment off of ground, under cover, and in a dry location.

1.8 COORDINATION

A. Coordinate installation of inserts, sleeves, block outs, elevator equipment with integral anchors, and other items that are embedded in concrete or masonry for elevator equipment. Furnish templates, inserts, sleeves, elevator equipment with integral anchors, and installation instructions and deliver to Project site in time for installation.

B. Coordinate locations and dimensions of work specified in other Sections that relates to electric traction elevators including pit ladders; sumps and floor drains in pits; entrance subsills; electrical service; and electrical outlets, lights, and switches in hoistways and pits.

1.9 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair, restore, or replace elevator work that fails in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.
2. Warranty Period: 1 year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with ASME A17.1/CSA B44.

B. Accessibility Requirements: Comply with requirements for accessible elevators in the United States Access Board's ADA-ABA Accessibility Guidelines and with ICC A117.1.

C. Seismic Performance: Elevator system shall withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7 and shall comply with elevator seismic requirements in ASME A17.1/CSA B44.

1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified and the system will be fully operational after the seismic event."
2. Project Seismic Design Category: B.
3. Elevator Component Importance Factor: 1.0.
4. Provide earthquake equipment required by ASME A17.1/CSA B44.
5. Provide seismic switch required by ASCE/SEI 7.

2.2 ELEVATORS

A. Elevator System, General: Manufacturer's standard elevator systems. Unless otherwise indicated, manufacturer's standard components shall be used, as included in standard elevator systems and as required for complete system.

B. Elevator Description:
1. Rated Load: 3500 lb.
2. Freight Loading Class for Service Elevator(s): Class A.
3. Rated Speed: 200 fpm.
4. Operation System: Selective-collective automatic operation.
5. Auxiliary Operations:
    a. Battery-powered automatic car return to first floor.
    b. Earthquake Emergency Operation: Comply with requirements in ASME A17.1/CSA B44.
    c. Automatic dispatching of loaded car.
    d. Nuisance-call cancel.
    e. Loaded-car bypass.
    f. Distributed parking.
    g. Off-peak operation.
    h. Automatic operation of lights and ventilation fans.
6. Car Enclosures:

    a. Inside Width: Not less than 80 inches from side wall to side wall.
    b. Inside Depth: Not less than 64-1/2 inches from back wall to front wall (return panels).
    c. Inside Height: Not less than 93 inches to underside of ceiling.

d. Front Walls (Return Panels): Satin stainless steel, ASTM A480/A480M, No. 4 finish.
e. Car Fixtures: Satin stainless steel, ASTM A480/A480M, No. 4 finish.
f. Side and Rear Wall Panels: Textured stainless steel.
g. Reveals: Satin stainless steel, ASTM A480/A480M, No. 4 finish.
h. Door Faces (Interior): Satin stainless steel, ASTM A480/A480M, No. 4 finish.
i. Door Sills: Nickel silver.
j. Ceiling: Satin stainless steel, ASTM A480/A480M, No. 4 finish.
k. Handrails: 1/2 by 2 inches rectangular satin stainless steel, at sides of car.
l. Floor prepared to receive resilient flooring (specified in Section 096516 "Resilient Sheet Flooring").

7. Hoistway Entrances:

a. Width: 42 inches.
b. Height: 84 inches.
c. Type: Single-speed side sliding.
d. Frames: Satin stainless steel, ASTM A480/A480M, No. 4 finish.
e. Doors and Transoms: Satin stainless steel, ASTM A480/A480M, No. 4 finish.
f. Sills: Nickel silver.

8. Hall Fixtures: Satin stainless steel, ASTM A480/A480M, No. 4 finish.
9. Additional Requirements:

a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from polished stainless steel, ASTM A480/A480M, No. 8 finish.

2.3 MACHINE ROOM-LESS ELECTRIC TRACTION ELEVATORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Otis Gen3 Core with glass back cab (HydroFit Configuration):

1. Schindler Elevator.
2. KONE Elevators.

B. Source Limitations: Obtain elevators from single manufacturer.

1. Major elevator components, including driving machines, controllers, signal fixtures, door operators, car frames, cars, and entrances, shall be manufactured by single manufacturer.

2.4 TRACTION SYSTEMS

A. Elevator Machines: Permanent magnet, variable-voltage, variable-frequency, ac-type hoisting machines and solid-state power converters.

1. Provide nonregenerative system.
2. Provide line filters or chokes to prevent electrical peaks or spikes from feeding back into building power system.

B. Fluid for Hydraulic Buffers: Fire-resistant fluid.

C. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work. Device installation is specified in another Section.

D. Machine Beams: Provide steel framing to support elevator hoisting machine and deflector sheaves from the building structure. Comply with Section 055000 "Metal Fabrications" for materials and fabrication.

E. Car Frame and Platform: Bolted- or welded-steel units.

F. Guides: Roller guides or polymer-coated, nonlubricated sliding guides. Provide guides at top and bottom of car and counterweight frames.

2.5 OPERATION SYSTEMS

A. Provide manufacturer's standard microprocessor operation systems as required to provide type of operation indicated.

B. Auxiliary Operations:
1. Single-Car Battery-Powered Automatic Evacuation: If power fails and car is at a floor, it remains at that floor, opens its doors, and shuts down. If car is between floors, it moves to the next floor above or below, opens its doors, and shuts down. System includes rechargeable battery and automatic recharging system.
2. Group Standby Power Operation:
3. Automatic Dispatching of Loaded Car: When car load exceeds 80 percent of rated capacity, doors begin closing.
4. Nuisance-Call Cancel: When car calls exceed a preset number while car load is less than a predetermined weight, all car calls are canceled. Preset number of calls and predetermined weight can be adjusted.
5. Loaded-Car Bypass: When car load exceeds 80 percent of rated capacity, car responds only to car calls, not to hall calls.
6. Distributed Parking: When cars are not required for response to calls, they are parked with doors closed and distributed in predetermined zones throughout the building. One zone to include the main floor and adjacent floors; remaining floors to be divided into approximately equal zones.
7. Off-Peak Operation: During periods of low traffic, half of the elevators in a group to be taken out of service and switched to sleep, low power mode.
8. Automatic Operation of Lights and Fan: When elevator is stopped and unoccupied with doors closed, lighting, ventilation fan, and cab displays are de-energized after five minutes and are re-energized before car doors open.
9. Priority Service: Service is initiated by a keyswitch at designated floors. One elevator is removed from group operation and directed to the floor where service was initiated. On arriving at the floor, elevator opens its doors and parks and a lighted sign directs passengers to exit elevator. Car is placed in operation by selecting a floor and pressing door close button or by operating keyswitch to put car in independent service. After responding to floor selected or being removed from independent service, car is returned to group operation. If car is not placed in operation within a preset time after being called, it is returned to group operation.

C. Security features may not affect emergency firefighters' service.

a. Security access system equipment is not in the Contract.

2. Keyswitch Operation: Push buttons are activated and deactivated by security keyswitches at car-control stations and hall push-button stations. Key is removable in either position.
3. Keypad Operation: Allows each landing to be restricted or unrestricted. When a restricted landing button is pressed, a "Restricted Floor" lamp lights and remains lit until landing access code has been entered into a keypad or predetermined time has elapsed. Car calls for restricted landings do not register until landing access code is entered into keypad within predetermined time after landing button is pressed.

a. Access codes are programmed at each car operating panel using a security keyswitch. Keypad operation can be activated and deactivated by security keyswitch at main landing.

4. Car-to-Lobby Feature: Feature, activated by keyswitch at main lobby, that causes car to return immediately to lobby and open doors for inspection. On deactivation by keyswitch, calls registered before keyswitch activation are completed and normal operation is resumed.

2.6 DOOR REOPENING DEVICES

A. Infrared Array: Provide door reopening device with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more light beams causes doors to stop and reopen.

B. Nudging Feature: After car doors are prevented from closing for predetermined adjustable time, through activating door reopening device, a loud buzzer sounds and doors begins to close at reduced kinetic energy.

2.7 CAR ENCLOSURES

A. Provide steel-framed car enclosures with nonremovable wall panels, withcar roof, access doors, power door operators, and ventilation.

1. Provide standard railings complying with ASME A17.1/CSA B44 on car tops where required by ASME A17.1/CSA B44.

B. Materials and Finishes: Manufacturer's standards, but not less than the following:

1. Subfloor:

a. Exterior, underlayment grade plywood, not less than 5/8-inch nominal thickness.

2. Floor Finish:

a. Specified in Section 096519 RESILIENT TILE FLOORING
3. Fabricate car with recesses and cutouts for signal equipment.
4. Fabricate car door frame integrally with front wall of car.

5. Stainless Steel Doors: Flush, hollow-metal construction; fabricated from stainless steel sheet.
6. Sight Guards: Provide sight guards on car doors.
7. Sills: Extruded or machined metal, with grooved surface, 1/4 inch thick.
8. Luminous Ceiling: Fluorescent light fixtures and ceiling panels of translucent acrylic or other permanent rigid plastic.
9. Ceiling: Metal flush panels, with four low-voltage downlights in each panel. Align ceiling panel joints with joints between wall panels.
10. Light Fixture Efficiency: Not less than 35 lumens/W.
11. Ventilation Fan Efficiency: Not less than 3.0 cfm/W.

2.8 HOISTWAY ENTRANCES

A. Hoistway Entrance Assemblies: Manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Frame size and profile to accommodate hoistway wall construction.

B. Materials and Fabrication: Manufacturer's standards, but not less than the following:
1. Steel Subframes: Formed from cold- or hot-rolled steel sheet, with factory-applied enamel or powder-coat finish or rust-resistant primer. Fabricate to receive applied finish as indicated.
2. Stainless Steel Doors and Transoms: Flush, hollow-metal construction; fabricated from stainless steel sheet.
3. Sight Guards: Provide sight guards on doors matching door edges.
4. Sills: Extruded or machined metal, with grooved surface, 1/4 inch thick.
5. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M.

2.9 SIGNAL EQUIPMENT

A. Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Provide vandal-resistant buttons and lighted elements illuminated with LEDs.

B. Car-Control Stations: Provide manufacturer's standard recessed or semirecessed car-control stations. Mount in return panel adjacent to car door unless otherwise indicated.

1. Mark buttons and switches for required use or function. Use both tactile symbols and Braille.
2. Provide "No Smoking" sign matching car-control station, either integral with car-control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.

C. Swing-Return Car-Control Stations: Provide car-control stations mounted on rear of hinged return panel adjacent to car door and with buttons, switches, controls, and indicator lights projecting through return panel but substantially flush with face of return panel.

1. Mark buttons and switches for function. Use both tactile symbols and Braille.

2. Provide "No Smoking" sign matching car-control station, either integral with car-control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.

D. Emergency Communication System: Two-way voice communication system, with visible signal, which dials preprogrammed number of monitoring station and does not require handset use. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.

E. Firefighters' Two-Way Telephone Communication Service: Provide flush-mounted cabinet in each car and required conductors in traveling cable for firefighters' two-way telephone communication service specified in Refer to the Fire Alarm drawings for further information.

F. Car Position Indicator: Provide illuminated, digital-type car position indicator, located above car door or above car-control station. Also, provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served. Include travel direction arrows if not provided in car-control station.

G. Hall Push-Button Stations: Provide one hall push-button station at each landing.

1. Provide units with flat faceplate for mounting with body of unit recessed in wall.
2. Equip units with buttons for calling elevator and for indicating desired direction of travel.

    a. Provide for connecting units to building security access system so a card reader can be used to register calls.

3. Provide telephone jack in each unit for firefighters' two-way telephone communication service specified in Refer to the Fire Alarm drawings for further information.

H. Hall Lanterns: Units with illuminated arrows; but provide single arrow at terminal landings. Provide one of the following:

1. Manufacturer's standard wall-mounted units, for mounting above entrance frames.
2. Units with flat faceplate for mounting with body of unit recessed in wall and with illuminated elements projecting from faceplate for ease of angular viewing.
3. Units mounted in both jambs of entrance frame.

I. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down.

1. At manufacturer's option, audible signals may be placed on cars.

J. Fire-Command-Center Annunciator Panel: Provide panel containing illuminated position indicators for each elevator, clearly labeled with elevator designation; include illuminated signal that indicates when elevator is operational and when it is at the designated emergency return level with doors open. Provide standby power elevator selector switch(es), as required by ASME A17.1/CSA B44, adjacent to position indicators. Provide illuminated signal that indicates when normal power supply has failed.

2.10 FINISH MATERIALS

A. Stainless Steel Sheet: ASTM A240/A240M, Type 304.
   1. Metal surface is satin polished after texturing.

B. Stainless Steel Tubing: ASTM A554, Grade MT 304.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Examine hoistways, hoistway openings, and pits as constructed; verify critical dimensions; and examine supporting structure and other conditions under which elevator work is to be installed.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

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

3.2 INSTALLATION OF MACHINE ROOM-LESS ELECTRIC TRACTION ELEVATORS

A. Comply with manufacturer's written instructions.

B. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.

C. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts to minimize vibration transmission to structure and structure-borne noise due to elevator system.

D. Lubricate operating parts of systems, including ropes, as recommended by manufacturers.

E. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

F. Leveling Tolerance: 1/8 inch, up or down, regardless of load and travel direction.

G. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.

H. Locate hall signal equipment for elevators as follows unless otherwise indicated:

   1. For groups of elevators, locate hall push-button stations between two elevators at center of group or at location most convenient for approaching passengers.

2. Place hall lanterns either above or beside each hoistway entrance.
3. Mount hall lanterns at a minimum of 72 inches above finished floor.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.

B. Operating Test: Load elevator to rated capacity and operate continuously for 30 minutes over full travel distance, stopping at each level and proceeding immediately to the next. Record temperature rise of elevator machine during 30-minute test period. Record failure to perform as required.

C. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times that tests are to be performed on elevators.

3.4 PROTECTION

A. Temporary Use: Comply with the following requirements for elevator used for construction purposes:

1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.
2. Provide strippable protective film on entrance and car doors and frames.
3. Provide padded wood bumpers on entrance door frames covering jambs and frame faces.
4. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
5. Do not load elevators beyond their rated weight capacity.
6. Engage elevator Installer to provide full maintenance service. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleanup, and adjustment as necessary for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
7. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate, adjust, and maintain elevator(s).

B. Check operation of elevator with Owner's personnel present before date of Substantial Completion and again not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.

3.6 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service to include 12 months' full maintenance by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Parts and supplies to be manufacturer's authorized replacement parts and supplies.

1. Perform maintenance during normal working hours.
2. Perform emergency callback service during normal working hours with response time of two hours or less.
3. Include 24-hour-per-day, 7-day-per-week emergency callback service with response time of two hours or less.

B. Provide elevator maintenance agreement.

END OF SECTION 142123.16

SECTION 310100 – MAINTENANCE OF EARTHWORK

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Project Survey and Layout. Includes construction stake-out, control points, and maintenance of all layout points during the Project.

B. Utility Locating Service

C. Utility Test Pits

D. Off-site Disposal of Excess Soil Materials

D. Moisture and Dust Control

E. Not Used

F. Restoration of existing facilities damaged as a result of this project. Items included but are not limited to: Pavements, curbs, concrete walks, and gutters, underground utilities, signs, ditches and swales.

1.2 PRE-CONSTRUCTION REQUIREMENT. The Contractor shall video the entire project site and all areas that will require restoration and supply the Owner's Representative with a copy of the video on a compact disk, or similar data electronic storage device.

1.3 RELATED DOCUMENTS - Refer to Section 312000 Earth Moving
Section 321313 Cement Concrete Paving

PART 2 - PRODUCTS

2.1 RESTORATION OF SURFACES. The quality of materials and the performance of work used in the restoration shall be equal to or better than the condition of each before the work began. In the event a surface or material requires restoration and the material is not specified under this Contract, the Contractor shall notify the Owner's Representative and submit to the Owner's Representative his proposed restoration plan. Such restoration shall be reviewed by the Owner's Representative.

2.2 TEMPORARY RESURFACING

A. Not Used

2.3 OTHER TYPES OF PAVEMENTS AND SURFACES. All pavement other than brick and concrete, and all gravel, crushed stone and other types of roadway surfaces, shall be replaced with new materials except where, in the opinion of the Owner's Representative, materials salvaged from stone or gravel roadways have been removed, handled, and stored in such a manner that their original quality has been maintained, in which case such salvaged materials may be used to the extent available in the lower portion of the roadway surfaces after proper

screening to remove dust and other excess material.

2.4 ROADSIDE DITCHES. All disturbed ditches and swales shall be regraded to their original grades. Ditches shall be topsoiled and seeded with new materials; topsoil (free from weeds, sticks, and stones) and a seed mix consistent with the remaining lawns.

2.5 MATERIALS FOR CONSTRUCTION STAKEOUT. The Contractor shall supply all stakeout materials.

PART 3 - EXECUTION

3.1 TEMPORARY RESURFACING AND REPAVING

A. Not Used

3.2 CONCRETE WALKS

A. Concrete walks removed in connection with or damaged as a result of construction operations under the Contract shall be replaced with new construction. Refer to Section 321313 (Cement Concrete Paving).

3.3 CURBS, GUTTERS, AND CULVERTS. The Contractor shall, at his own expense, permanently repair and relay all curbs, gutters, roadway and driveway culverts where the same have been broken, damaged, or disturbed by the Contractor in executing any of the work covered by the Contract or by or on account of said work. The Contractor shall restore the same in a manner, to a condition and with material, either new or old as required, similar and equal to what existed before the start of this project.

3.4 WORK ADJACENT TO EXISTING BUILDINGS. Contractor shall take care to protect existing building features when earthwork and soil compaction is performed near buildings. Additional care and coordination with the Owner's Representative may be required.

3.5 DUST CONTROL. The Contractor shall minimize dust from disturbed soil surfaces or other materials that can cause onsite or off-site damage, health hazards, and traffic safety problems. Dusty conditions resulting from the Contractor's operations shall be corrected at no additional cost to the Owner.

3.6 UNDERGROUND FACILITIES. The Contractor shall repair or replace all disturbed underground facilities by methods approved by the Owner's Representative and regulatory agencies. The Contractor shall mark out all valves found within the limits of the work site and record locations for raising or lowering of valve box covers.

3.7 CONSTRUCTION STAKEOUT. The Contractor shall perform all construction stakeout work necessary to establish, spatially position, measure, and verify the locations of existing and proposed terrain features of the Project.

A. The following types of Survey Operations shall be performed under the direction of a New York State Licensed Land Surveyor:

1.) Location of property markers

2.) Tie measurements to, or resetting of controlpoints

B. The following types of Survey Operations shall be performed under the direction of a New York State Licensed Land Surveyor or New York State Licensed Professional Engineer:

1.) Establishment or reestablishment of primary or secondary control which shall be used for:
   a. Establishing location for horizontal or vertical roadway alignment.
   b. Establishing location for the horizontal or vertical alignment of a structure, or feature for which the coordinates or elevations are indicated on the contract drawings.
   c. Establishing reference station for Global Positioning System (GPS) control work.

2.) Establishing new horizontal or vertical roadway alignment in the field from contract control either by conventional stakeout methods or by use of automated equipment operations. If the Contractor utilizes automated equipment for stakeout, he shall coordinate his locations and grades with the Owners Representative by utilizing an acceptable benchmark method to ensure proper grading.

3.8 UTILITY LOCATING SERVICE.

All of the underground utilities at the project site are owned by the Campus, the Contractor shall locate utilities not covered under the Dig Safely New York program. As such, the Contractor shall hire the services of an Underground Utility Locator Service. Utility Locator Service (ULS) shall meet the following requirements:

- At least 5 years experience of providing underground utility location services. Firm providing this service shall be acceptable to the Owner.
- The ULS shall provide the equipment and competent operation required for Ground Penetrating Radar (GPR), electro-magnetic induction, as well as standard pipe and cable locating techniques.
- ULS shall review all utility plans, construction plans, and record plans that are provided by the Owner to determine the precise location of underground utilities in areas that are scheduled for excavation by the Contractor.
- Provide materials required to mark the locations of underground utilities in the field for the Contractor.
- Observe all Federal, State, and Campus Safety Regulations.
- Coordinate utility locating and marking with Utility Location that is performed as part of the Dig Safe New York (811) program for utilities coming into the Campus.
- Record position of buried utilities and provide to the Owner’s Representative.

Cost of the Utility Locating Service will be the responsibility of the Contractor. Contractor shall notify the Utility Locating Service such that all required utility clearances are performed prior to the start of any excavation.

3.9 UTILITY TEST PITS

The Contractor shall, at his own discretion, excavate and backfill test pits in order to determine existing underground utility type, size, elevation and where utility crossings or new utility connections to existing facilities are proposed. The Contractor shall excavate and backfill test pits in a manner approved by the Owner’s Representative that prevents damage to wrappings,

coatings or other protective coverings, such as by hand digging, vacuum excavation or similar non-destructive locating equipment. The limits of the excavation shall be those sufficient to determine existing utility type, size and/or condition.

Contractor shall coordinate with the Owner's Representative regarding the location of the exposed utility. At a minimum, this effort will include the following:

- Coordinate work with ULS.
- Installing a wood stake (nominal 2" x 4" x 24" long) into the ground, as close as possible, at a known offset from the utility.
- Measure and record the horizontal offset distance from the stake to the utility, the vertical depth from the top of stake to top of utility, the size of the exposed utility, and it's apparent material composition.
- Protect wood stake from damage.
- Backfill test pits in kind with the surrounding soils or if needed, with suitable material as defined in Section 3l0513. Existing utility to be placed on a bedded course material and covered with a lining course material as defined in Section 310516.

Utility Test Pit Excavation work shall include the furnishing all labor, materials and equipment necessary to excavate, locate, and backfill the test pit and replace any pavement, shoulder and sidewalk courses, subbase courses, curbs, drives, lawns and other top surfaces required to complete the work.

3.10 DISPOSAL OF EXCESS SOIL MATERIALS OFF-SITE

A. If the Contractor elects to remove soils from the site, it will be the Contractor's responsibility to legally dispose of these materials off Owner's property.

It will be the Contractor's responsibility to coordinate a location for off-site fill materials, and ensure that the following requirements are adhered to at the off-site location (as applicable):

- Releases from Property Owners.
- Approvals and permits from the local municipality.
- Permits from the U.S. Army Corps of Engineers and NYS DEC if the fill site is near streams, wetlands, or floodplains.
- Adherence to the NYS DEC requirements for stormwater discharges from the fill site , as they apply to General Permit No. GP-0-20-001 (permit for stormwater discharges from construction activity).
- Installation of erosion and sediment control features at the fill site, and grading / stabilization of the fill site.

END OF SECTION 310100

SECTION 310513 – SOILS FOR EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Suitable soil material for fill, backfill and embankment construction.
2. Structural Fill for various locations of backfill and embankment construction.
3. Not Used.
4. Bioretention Soil for placement at the dry swale construction.

B. Related Sections:

1. Division 31 Section 310516 “Aggregates for Earthwork” for various stone and sand aggregates used as part of this project.
2. Division 31 Section 312000 “Earth Moving” for excavation, backfill, placement and compaction of various soil types.
3. Division 31 Section 312319 “Dewatering” for construction dewatering.
4. Division 31 Section 315000” Excavation Support and Protection” for temporary excavation support and protection systems.
5. Section 329113 Soil Preparation

1.2 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Borrow Soil: Satisfactory (suitable) soil imported from off-site for use as fill or backfill.

C. Fill: Soil materials used to raise existing grades.

D. Structural Fill: Material as defined in Section 310516, Type A1 Aggregate.

E. Select Granular Fill: Material as defined in Section 310516, Type A2 Aggregate. On site soil materials meeting this requirement can be substituted for this use if suitable material is available. On site material will be considered by the Owner’s Representative for substitution if the Contractor can demonstrate that on site material can be modified to meet the requirements of this material.

F. Not Used.

G. Bioretention Soil: Soil for use in dry swales that consists of a uniform mix of sand and topsoil, free of stones, stumps, roots (or other objects larger than 2” in diameter), and free of noxious weeds.

H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 3/4 cu. yd. or more in volume that exceed a standard penetration resistance of 100 blows/2 inches when tested by a geotechnical testing agency, according to ASTM D1586.

I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.3 SUBMITTALS

A. Product Data: For each type of the following manufactured products required:

1. Soil Materials (if imported from off-site).

B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:

1. Classification according to ASTM D2487.
2. Laboratory compaction curve according to ASTM D 1557.

1.4 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E329 and ASTM D3740 for testing indicated.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Suitable Embankment Material – Suitable Material is defined as soil material whose composition is satisfactory for embankment construction. The moisture content of the material has no bearing upon this designation. In general, any mineral (inorganic) soil, blasted or broken rock and similar materials of natural or man made (i.e. recycled) origin, including mixtures thereof, are considered suitable materials. Determination of whether a specific natural or man made material is a suitable material shall be made by the Owner's Representative on the above basis.

Furthermore, Suitable Material shall be soil that falls within Classification Groups GW, GP,

GM, SW, SP, SM according to ASTM D2487 *"Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)"*, or a combination of these groups.

1. Material shall be free of rock or gravel larger than 3-inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
2. Soil classified as GM, SP or SM can be used; however, these soil types can be moisture sensitive and difficult to work with. No additional expense shall be incurred by the Owner if the Contractor chooses to use these materials and the required compaction cannot be achieved.

C. Unsuitable Material – Unsuitable Material is defined as any material containing vegetable or organic matter, such as muck, peat, organic silt, topsoil, or sod, that is not satisfactory for embankment construction. Certain man made deposits of industrial waste, toxic or contaminated materials, sludge, landfill, or other materials may also be determined to be unsuitable, based on an evaluation by the Owner's Representative.

1. Soils that are Unsuitable Material are further defined as soil within the Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D2487 *"Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)"*, or a combination of these groups.

2. Broken pieces or sections of asphalt pavement, macadam, or similar construction debris material that contains petroleum based products are also considered unsuitable for this Project.

3. The moisture content of a soil has no bearing upon the designation of a soil material as being an unsuitable or suitable soil. (Refer to Section 312000, Earthmoving).

D. Not Used

E. Bioretention Soil – Defined as uniform mix of three (3) parts sand and one (1) part topsoil, by volume. This soil shall be free of stones, stumps, roots (or other objects larger than 2" in diameter), and free of noxious weeds. The Bioretention soil shall have a pH range of 5.2 to 7.6, and an organic content of 6% to 7%. In order to meet the requirement of 6% to 7% organic content in the bio soils, the Contractor may add suitable compost material to achieve this requirement for organic content. Compost that is used shall meet the requirements of NYSDOT Standard Specifications Section 713-15.

1.) Topsoil shall be onsite material when possible amended to meet the following general requirements:
- pH range between 5.5 and 7.6
- Organic Content not less than 6% or more than 12% (dry weight basis)
- Percent of topsoil (by weight) that passes through a No. 200 (75-µm) US standard sieve is 20% to 65%.

2.) Requirements for Sand:
- Meeting the requirements of Sand, A9 Aggregate, as defined in Section 310516.

3.) Soil Amendments to increase organic content shall be peat moss. Peat moss shall be commercially produced, composed of the partly decomposed stems and leaves of any or several species of sphagnum moss.

4.) The Contractor shall provide the Owner's Representative with a copy of the soil test results that show the overall gradation, organic content, and concentration of soil phosphorus. (Concentration of soil phosphorus will not be a basis for acceptance or rejection of the bioretention soil, but is required for the Owner's records).

F. Topsoil – Refer to Section 329113 for additional requirements. Topsoil may be naturally occurring or may be manufactured.

If naturally occurring topsoil exists on the site it shall be the surface layer of soil removed during soil stripping operations.

All topsoil shall be free from refuse, material toxic or otherwise deleterious to plant growth, subsoil, sod clumps, seeds or other viable propagules of invasive plants, woody vegetation and stumps, roots, brush, refuse, stones, clay lumps, or similar objects.
Construction and demolition debris as classified under 6 NYCRR Part 360, other than uncontaminated land clearing debris, shall not be used to manufacture or amend topsoil. Sod and herbaceous growth such as grass and non-invasive weeds need not be removed but shall be thoroughly broken up and mixed with the soil during handling or manufacturing operations.

Existing topsoil stripped and stockpiled shall be tested and amended by the Contractor as needed to meet the requirements of Specification Section 329113.

PART 3 - EXECUTION

3.1 STORAGE OF SOIL MATERIALS - Refer to Section 312000 (Earthmoving).

3.2 PLACEMENT OF SOIL MATERIALS IN EMBANKMENT CONSTRUCTION

- Refer to Section 312000 (Earthmoving) for Embankment Construction.

END OF SECTION 310513

SECTION 310516 – AGGREGATES FOR EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aggregates for subgrades for pavements and utility installation.
2. Subbase course to be placed and compacted in advance of asphalt paving.
3. Aggregate Material for pipe bedding.
4. Fine Aggregate Material for conduit bedding.
5. Foundation Backfill Material.
6. Underdrain Filter Stone.
7. Stone Filling (Heavy & Medium) for Bank and Channel Protection.
8. Stone Filling (Light) for soil erosion control.

B. Related Sections:
1. Section 31 23 19 Dewatering
2. Section 31 50 00 Excavation Support and Protection
3. This Specification makes reference to the New York State Department of Transportation (NYSDOT) Standard Specifications

1.2 DEFINITIONS

A. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

B. Lining Course: Aggregate layer placed around and above the installed pipe or underground utility in a trench.

C. Medium and Fine Stone Filling: Shall consist of well graded stone placed as protective material on stream-banks, in channels and elsewhere, as required.

D. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a Portland cement concrete pavement.

E. Structural Fill: Subbase Course placed for the construction of the new building and exterior stairs.

F. Underdrain Filter Stone: Shall consist of crushed stone, gravel, or screened gravel (pea stone) that is similarly graded in size.

1.3 SUBMITTALS

A. Product Data: For each type of the aggregate product required, certify that the material requirements in Part 2 of this Section are met.

B. Materials Certificate: Certify that products meet or exceed the New York State Department of Transportation (NYSDOT) Standard Specifications requirements as follows:
1. Section 203: Materials – Excavation and Embankment
2. Section 304: Materials - Subbase Course.
3. Section 605: Materials - Underdrains.
4. Section 620: Materials - Bank and Channel Protection.

1.4 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work

B. Perform Work in accordance with the NYSDOT Standard Specifications :
1. Section 203: Excavation and Embankment
2. Section 207: Geosynthetics.
3. Section 304: Subbase Course.
4. Section 605: Underdrains
5. Section 620: Bank and Channel Protection.

C. Preinstallation Conference: Conduct conference at Project site.

D. Material Test Reports: For Subbase (A1), Select Granular Fill (A2), and Bedding & Lining Course (A4) provide tests as follows:

1. Laboratory compaction curve according to ASTM D 1557.

PART 2 - PRODUCTS

2.1 AGGREGATE MATERIALS

A. Subbase Material: Coarse Aggregate Type A1: Conforming to NYSDOT Subbase Item 304.12, Type 2 Subbase. Certify that the Type A1 aggregate meets these requirements, as noted in Section 733-04 of the NYSDOT Materials Specifications.

B. Select Granular Fill: Coarse Aggregate Type A2 (Gravel): Conforming to the material requirements for Select Granular Fill, NYSDOT Item 203.07. Certify that the Type A2 aggregate meets these requirements as noted in Section 733-11 of the NYSDOT Materials Specifications.

C. Drainage Fill Material: Aggregate Type A3: Shall be a crushed angular washed stone that meets the material requirements as per Section 703-02 of the NYSDOT Standard Specifications for Coarse Aggregate. This material shall meet the size designation for # 2 Stone, as shown in Table 703-4 of Section 703-02 of the NYSDOT Standard Specifications.

D. Bedding and Lining Course: Aggregate Type A4: Crushed Stone; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve. Certify that the Type A4 aggregate meets these requirements.

E. Underdrain Filter Stone: Fine Aggregate Type A5: Certify that this aggregate will meet the following requirements: Natural stone; washed, free of clay, shale, organic matter; graded in

accordance with ASTM C136 (or NYSDOT Underdrain Type 1, Item 605.0901); to the following limits:

a. Minimum Size: 1/4 inch.
b. Maximum Size: 5/8 inch.

F. Stone Filling (Heavy): Aggregate Type A6: Certify and furnish materials in accordance with NYSDOT Standard Specifications for Item 620.05.

G. Stone Filling (Medium): Aggregate Type A7: Certify and furnish materials in accordance with NYSDOT Standard Specifications for Item 620.04.

H. Stone Filling (Fine): Aggregate Type A8: Certify and furnish materials in accordance with NYSDOT Standard Specifications for Item 620.02.

I. Sand: Fine Aggregate Type A9: Certify and furnish natural river or bank sand; free of silt, clay, loam, friable or soluble materials, and organic matter; graded in accordance with ASTM C136; within the following limits:

Sieve Size	Percent Passing
No. 4	100
No. 14	90 to 100
No. 200	0 to 5

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 STOCKPILING OF AGGREGATE MATERIALS

A. Stockpile materials on site at locations designated by and coordinated with the Owner’s Representative.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate different aggregate materials with dividers or stockpile individually to prevent mixing.

D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials or oversaturation of materials. If materials come on site or become oversaturated, it is the contractors responsibility to work the material to fall within optimum moisture content at his own expense.

E. Remove stockpile at completion of work. Leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

3.3 INSTALLATION OF SUBBASE COURSE

A. Install granular subbase in accordance with NYSDOT Standard Specifications , Section 304-3 (Construction Details - Subbase Course) to compacted depth indicated in Contract Documents.

B. Place subbase course on subgrades free of mud, frost, snow, or ice.

C. Spread and place granular subbase in maximum 6-inch layers and compact to 95% modified proctor maximum density with a 10 ton minimum self propelled tandem roller.

D. Level and contour surfaces to elevations and gradients indicated in Contract Drawings.

E. If moisture content is too low, add water incrementally to attain the optimum moisture content to assist in compaction. If excess water is apparent, remove contaminated granular subbase and aerate to reduce moisture content.

F. Use mechanical tamping equipment in areas inaccessible to rolling equipment.

3.4 GRANULAR SUBBASE TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

B. Scheduled Compacted Thickness: Within 1/4 inch.

C. Variation from True Elevation: Within 1/2 inch.

3.5 GRANULAR SUBBASE FIELD QUALITY CONTROL

A. Compaction testing will be performed in accordance with ANSI/ASTM D1556, ANSI/ASTM D1557, or ASTM D2922.

B. If tests indicate work does not meet specified requirements, remove work, replace and retest.

C. Frequency of Tests: One minimum plus one for every 5,000 sq. ft. of pavement.

3.6 PLACEMENT, GENERAL

A. Place geotextile fabric in accordance with NYSDOT Standard Specifications , Section 207-3 (Construction Details - Prefabricated Composite Drains for Structures) as indicated on Drawings.

B. Place stone filling in accordance with NYSDOT Standard Specifications , Section 620-3 (Construction Details - Bank and Channel Protection) at embankment slopes as indicated on Drawings.

C. Install to thickness as indicated on Drawings.

3.7 DISPOSAL OF MATERIAL

A. Materials displaced thru the use of the above operations shall be disposed of by the Contractor offsite. The cost of such clean-up and removal shall be included in the price of the materials. Refer to Specification Section 310100 for off-site disposal of excess soil materials.

END OF SECTION 310516

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SECTION 310519 – GEOSYNTHETICS FOR EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Geotextile Fabric.

1.2 DEFINITIONS

A. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

B. Geotextile Fabric: Includes Geotextile Stabilization and Geotextile Separation.

1.3 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work

B. Manufacturer's Certificate: Certify that products meet or exceed the New York State Department of Transportation (NYSDOT) Standard Specifications requirements as follows:
   1. Section 207-2: Materials -Geotextiles and Prefabricated Composite Drains for Structures.

C. Perform Work in accordance with the NYSDOT Standard Specifications :
   1. Section 207: Geotextiles and Prefabricated Composite Drains for Structures.

D. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS & SUBMITTALS

2.1 MATERIALS

A. Geosynthetic material brought to the project site shall be provided in rolls wrapped with covering for protection from mud, dirt, dust, and debris.

B. Geotextile Filter Fabric: (placed at temporary construction entrances for erosion control, and silt fence) Filter Fabric Type A shall be provided for installation at locations indicated on the drawings and as specified herein. Filter Fabric Type A shall be composed of high-tenacity polypropylene yarns, meeting the requirements of Mirafi® 500X or approved equal. The geotextile fabric shall be inert to commonly encountered chemicals; shall be resistant to mildew, rot, ultraviolet light, insects, and rodents; and shall have the indicated properties:

Physical Property	Test Method	Minimum Average Roll Value
Fabric Weight	ASTM D5261	4.0 oz / yd²
Grab Strength	ASTM D4632	200 lb.
Grab Elongation	ASTM D4632	15 %
Apparent Opening Size	CW-02215	40 (U.S. Standard Sieve Size)

At geotextile separation areas where a non-woven geotextile is specified, Contractor has option of provide Mirafi 140N or approved equal, or a material from item 2.1 C below.

C. Geotextile Separation Fabric: (place beneath roadway subbase) Shall be in accordance with the NYSDOT Approved List for Geosynthetics for Highway Construction, for the following parameters:
   1. Geotextile Separation:
      a. Meet requirements of Separation (S).
      b. Default strength class 2.

D. Geotextile Stabilization Fabric: (place beneath Heavy, Medium, and Fine Stone Fill, (Aggregate Types A6, A7, and A8). Stabilization Fabric shall be in accordance with the NYSDOT Approved List for Geosynthetics for Highway Construction for the following parameters:
   a. Meet requirements of Stabilization (ST).
   b. Default strength class 1.

   Product Submittal: Submit a geotextile fabric product that meets these requirements, and is on the NYSDOT Approved List.

2.2 SUBMITTALS AND CERTIFICATIONS

A. Submittals and Certifications required are as follows:

1. Catalog data showing that the Geotextile Filter Fabric meets the requirements specified.
2. Catalog data showing that the Geotextile Separation Fabric meets the requirements specified, as well as verification that it is a material from the NYSDOT Approved List.

   Catalog data showing that the Geotextile Stabilization Fabric meets the requirements specified, as well as verification that it is a material from the NYSDOT Approved List.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Place Geosynthetic Materials with reference to Division 31 Section 312000 “Earth Moving”.

3.2 CONSTRUCTION METHODS

A. Separation Fabric and Stabilization Fabric shall be installed in accordance with the details shown on the Contract Drawings and in accordance with the manufacturer's recommendations. Contractor shall protect fabric from exposure to sunlight during transportation and storage. After placement, the stabilization fabric shall not be left exposed for more than two weeks. Traffic or construction equipment shall not operate directly on the stabilization fabric. Seams on adjacent rolls shall be overlapped a minimum of 2 feet. Stabilization fabric which becomes torn or damaged shall be replaced or patched. The patch shall extend three feet beyond the perimeter of the torn or damaged area.

END OF SECTION 310519

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SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Attention is directed to the Contract and General Conditions and all Sections of Division 01 – General Requirements which are hereby made a part of the Specification.

B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this Section.

C. Coordinate work with that of all other trades affecting or affected by work of the Section. Cooperate with such trades to assure steady progress of all work under the Contract.

1.2 SUMMARY

A. This Section includes the following:

1. Protecting existing trees to remain.
2. Removing existing trees.
3. Clearing and grubbing.
4. Removing above- and below-grade site improvements.
5. Disconnecting, capping or sealing, and abandoning site utilities in place and removing site utilities.

B. Related Sections include the following:

1. Division 01 Section "Temporary Facilities and Controls" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities, and temporary erosion and sedimentation control procedures.
2. Division 02 Section "Structure Demolition" for demolition of buildings, structures, and site improvements.
3. Division 31 Section “Erosion and Sedimentation Controls” for erosion control.
4. Division 31 Section "Earth Moving" for soil materials, excavating, backfilling, and site grading.
5. Division 32 Section “Soil Preparation” for finish grading including preparing and placing planting soil mixes and testing of topsoil material.

1.3 DEFINITIONS

A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; and free of subsoil and weeds, roots, toxic materials, or other non-soil materials.

B. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

1.4 MATERIAL OWNERSHIP

A. Except for materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 SUBMITTALS

A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

B. Record drawings, according to Division 01 Section "Project Record Documents," identifying and accurately locating capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 QUALITY ASSURANCE

A. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.7 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

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

B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 31 Section "Earth Moving."

1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly flag trees and vegetation to remain or to be relocated.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to Erosion and Sediment Control Plan and Storm Water Pollution Prevention Plan.

B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE PROTECTION

A. Erect and maintain temporary fencing around tree protection zones before starting site clearing. Remove fence when construction is complete.

1. Do not store construction materials, debris, or excavated material within fenced area.
2. Do not permit vehicles, equipment, or foot traffic within fenced area.
3. Maintain fenced area free of weeds and trash.

B. Do not excavate within tree protection zones, unless otherwise indicated.

C. Where excavation for new construction is required within tree protection zones, hand clear and excavate with air spade to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

1. Cover exposed roots with burlap and water regularly.
2. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
3. Coat cut faces of roots more than 1-1/2 inches (38 mm) in diameter with an emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
4. Backfill with soil as soon as possible.

D. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Engineer.

3.4 UTILITIES

A. Owner 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. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

1. Arrange with utility companies to shut off indicated utilities.

2. Owner will arrange to shut off indicated utilities when requested by Contractor.

C. 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 Owner, Engineer and Owner’s Representative not less than four days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Engineers written permission.

D. Excavate for and remove underground utilities indicated to be removed.

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Cut minor roots and branches of trees indicated to remain in a clean and

careful manner where such roots and branches obstruct installation of new construction.

3. Grind stumps and remove roots, obstructions, and debris extending to a depth of 18 inches (450 mm) below exposed subgrade.
4. Use only hand methods for grubbing within tree protection zone.
5. Chip removed tree branches and dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

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.

3.6 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.
2. Paint cut ends of steel reinforcement in concrete to remain to prevent corrosion.

3.7 DISPOSAL

A. Disposal: Remove unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

1. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

END OF SECTION 311000

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SECTION 312000 EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Attention is directed to the Contract and General Conditions and all Sections of Division 01 – General Requirements which are hereby made a part of the Specification.

B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this Section.

C. Coordinate work with that of all other trades affecting or affected by work of the Section. Cooperate with such trades to assure steady progress of all work under the Contract.

1.2 SUMMARY

A. The Work of this Section includes all labor, materials, equipment and services necessary to complete the earthwork as shown on the drawings and/or specified herein, including but not necessarily limited to the following:

1. Laying out and staking all lines and levels.
2. Preparing subgrades for slabs-on-grade, walks, pavements, lawns, and plantings.
3. Base course for pavements.
4. Subsurface drainage backfill for walls.
5. Dewatering.
6. Pneumatic trenching (air spade) within drip line of trees to remain.
7. Separation and filter fabrics. Preparing sub-grades for slabs-on-grade, walks, pavements, turf, grasses and plants.
8. Excavating and backfilling for structures.
9. Subsurface drainage backfill for walls and trenches.
10. Excavating and backfilling trenches for utilities and pits for buried utility structures.
11. Undercutting
12. Placement and compaction of soil fill materials for embankment construction.
13. Rock Excavation
14. Detention pond installation

B. Related Sections include the following:

1. Division 31 Section “Soil Erosion and Sedimentation Control” for the Stormwater Pollution Prevention Plan and stormwater discharge permit requirements.

2. Division 31 Section "Site Clearing" for temporary erosion and sedimentation control measures, site stripping, grubbing, and removal of above- and below-grade improvements and utilities.
3. Division 31 Section ”Maintenance of Earthwork”
4. Division 31 Section ”Soils for Earthwork”
5. Division 31 Section ”Aggregate for Earthwork”
6. Division 31 Section ”Geosynthetics for Earthwork”
7. Division 32 Section "Soil Preparation" ~~for finish grading, including preparing and placing topsoil and planting soil for lawns.~~
8. Division 32 Section “Plants" for planting bed establishment and tree and shrub pit excavation and planting.
9. Division 32 Section “Turf & Grasses” for lawn establishment.
10. Division 33 Sections “Storm Drainage”, “Sanitary Sewerage” and “Water Distribution” for utility improvements.

1.3 DEFINITIONS

A. Backfill: Soil materials used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Bedding Course: Layer placed over excavated subgrade in a trench before laying a pipe.

C. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.

D. Drainage Course: Layer supporting slab-on-grade used to minimize capillary flow of pore water.

E. Excavation: Removal of material encountered above subgrade elevations.

1. Additional Excavation: Excavation below subgrade elevations as directed by Landscape Architect. Additional excavation and replacement will be paid for according to Contract provisions for changes in the Work.
2. Bulk Excavation: Excavations more than 10 feet (3 m) in width and pits more than 30 feet (9 m) in either length or width.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by the Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.

F. Fill: Soils materials used to raise existing grades.

G. Rock: Rock materials in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material exceeding 1 cu. yd. (0.76 cu. m) for bulk excavation or ¾ cu. yd. (0.57 cu. m) for footing, trench, and pit excavation that cannot be removed by rock excavating

equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

1. Excavation of Footings, Trenches, and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch (1065 mm) wide, short-tip-radius rock bucket; rated at not less than 120-hp (89 kW) flywheel power with bucket-curling force of not less than 25,000 lbf (111 kN) and stick-crowd force of not less than 18,700 lbf (83 kN); measured according to SAE J-1179.
2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 210 hp (157 kW) flywheel power and developing a minimum of 45,000 lbf (200 kN) breakout force; measured according to SAE J-732.

H. Structures: Building, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Subbase course: Course placed between the subgrade and a cement concrete or hot mix asphalt pavement.

J. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below base, drainage fill, or topsoil materials.

K. Utilities include on-site underground pipes, conduits, ducts, cables, and appurtenant structures.

1.4 QUALITY ASSURANCE

A. Pre-excavation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section “Project Meetings.”

1.5 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities servicing facilities occupied by Owner or others unless permitted in writing by Owner’s Representative and then only after arranging to provide temporary utility services according to requirements indicated:

1. Do not proceed with utility interruptions without Owner’s Representative’s written permission.
2. Contact Dig Safely New York at 1-800-962-7962 (811) before starting site clearing or excavation operations.
3. Coordinate with Owner and utility companies to shut off services if lines are active.
4. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to the satisfaction of utility owner.

PART 2 - PRODUCTS

A. Refer to Specification Sections 310100, 310513, 310516, and 310519.

2.2 PNEUMATIC EXCAVATION (AIR SPADE)

A. Pneumatic Excavating Tool: Excavation within drip line of trees to remain shall be performed through the use of a pneumatic excavation tool with the following requirements:

1. The high air velocity excavation tool shall be specifically designed to fracture, pulverize, and displace porous and semi-porous soils without harming or causing damage to tree roots, existing subsurface utilities or other non-porous objects. The Contractor shall submit catalog cuts from the manufacturer verifying that the pneumatic excavation tool meets the following criteria:

a.	Rated Operating Pressure	6.2 - 7.0 bar
b.	Air Stream Velocity at Cutting Head	2,200 – 2,500 km/hr
c.	Air Displacement	4,000 – 5,000 L/min

B. Air Compressor: The air compressor may be either a portable or truck-mounted unit and shall be adequately sized as required to power the pneumatic excavation tool in accordance with the manufacturer's recommendations for the pneumatic excavating tool.

C. Vacuum Truck: A vacuum truck should be used to collect excavated spoil directly from the trench or pit.

D. Containment Structure: To prevent the spread of excavated soil onto adjacent roadways and areas beyond the designated work zone limits, the Contractor shall provide a mobile structure or barrier to contain the material dislodged by the pneumatic excavation tool from the trench or pit. Timber or corrugated metal shields, tents supported on tubular frames, or other structures as approved by Landscape Architect may be used

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where earthwork is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge or soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 DEWATERING

A. Refer to Specification Section 312319. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

1. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water from excavations. Maintain water levels below base of excavation to control hydrostatic pressure on subgrade soils.
2. Establish and maintain temporary drainage ditches and other diversion outside excavation limits to convey rain water and water removed from excavations to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.
3. Do not discharge sediment laden water into the adjoining storm or sanitary sewer system or open swales. Pump sediment laden water from excavations into a portable sediment tank or a high-strength, non-woven geotextile fabric bag. Size portable sediment tanks in accordance with the New York Guidelines for Urban Erosion and Sediment Control.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
2. Install a dewatering system as needed to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.4 EXPLOSIVES

A. Explosives: Do not use explosives.

3.5 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

B. Stability of Excavations: Slope sides of excavations to comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

C. Material Storage: Stockpile satisfactory excavated materials where directed until required for backfill or fill. Place, grade and shape stockpiles for proper drainage.

1. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.
2. Dispose of excess soil material and waste materials not re-used.

3.6 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended for bearing surface.

3.7 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated cross section, elevations, and grades.

3.8 APPROVAL OF SUBGRADE

A. When excavation has reached required subgrade elevations, notify Geotechnical Engineer who will make an inspection of conditions.

B. If Geotechnical Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the building slabs and pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Proof-rolling is to be done in the presence of the project Geotechnical Engineer after excavation to required subgrade elevations. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction**,** repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
2. Proof-roll with a self propelled roller in non-vibratory mode weighing at least 14,000 lbs.
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Geotechnical Engineer, and replace with compacted structural fill as directed.

D. Additional Excavation:

1. If unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper and replace excavated material as directed by the Geotechnical Engineer. Excavation of unsuitable material must extend laterally beyond the edge of the footing or slab for a distance equal to or greater than the required depth of the excavation.
2. Removal of unsuitable material and its replacement as directed will be paid on basis of contract conditions relative to changes in work.
3. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect.

3.9 UNAUTHORIZED EXCAVATION

A. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimension without specific direction of Geotechnical Engineer. Unauthorized excavation, as well as remedial work directed by Geotechnical Engineer, shall be at Contractor’s expense.

B. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by Geotechnical Engineer.

1. Fill unauthorized excavation under other construction or utility pipe as directed by Engineer.

3.10 STORAGE OF SOIL MATERIALS

A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Surveying locations of underground utilities for record documents.
2. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
3. Inspecting and testing underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.

B. Coordinate backfilling with utilities testing.

C. Install warning tape directly above utilities, 18 inches below finished grade, except 6 inches below subgrade under pavements and slabs

3.12 FILL

A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.

B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

C. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under base course for walks and pavements, use satisfactory soil material.
3. Under footings and foundations, use Granular Base NYSDOT Type 2 (Type A1 Aggregate, as per Section 310516). Under footings and foundations, use Structural Fill to existing grade elevation. All fill placed above existing grade elevation is to be Lightweight Structural Fill. Reference Specification Section 312353, Lightweight Aggregate Structural Fill.

3.13 MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.14 COMPACTION OF BACKFILLS AND FILLS

A. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill material at 95 percent of Modified Proctor at +/- 2% optimum moisture content..
2. Under walkways, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill material at 92 percent.
3. Under lawn or unpaved areas, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill material at 85 percent.
4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.15 GRADING

A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn or Unpaved Areas: Plus or minus 1 inch (25 mm).
2. Pavements: Plus or minus 1/4 inch (13 mm).

3.16 SUBBASE COURSES

A. Place subbase course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course under pavements and walks as follows:

1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.

2. Place subbase course material over subgrade under hot-mix asphalt pavement.
3. Shape subbase course to required crown elevations and cross-slope grades.
4. Place subbase course 6 inches or less in compacted thickness in a single layer.
5. Place subbase course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
6. Compact subbase course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

C. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.17 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Geotechnical Engineer.

D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed as the following locations and frequencies:

1. Paved Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 200 sq. ft. (186 sq. m) or less of paved area, but in no case fewer than three tests.
2. Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least 1 test for every 2000 sq. ft. or less of building slab, but in no case fewer than 3 tests.
3. Foundation Wall Backfill: At each compacted backfill layer, at least 1 test for each 100 feet or less of wall length, but no fewer than 2 tests.
4. Trench Backfill: At each compacted initial and final backfill layer, at least 1 test for each 150 feet or less of trench length, but no fewer than 2 tests.

3.18 PROTECTION

A. Protecting Graded Areas: Protect newly grades areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and re-establish 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 the Owner's Representative; 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.

D. Protection of Persons and Property: Barricade or steel plate open excavations occurring as part of this work and post with warning lights.

1. Operate warning lights as recommended by authorities having jurisdiction.
2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthworks operations.

3.19 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property. Refer to Specification Section 310100.

END OF SECTION 312000

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SECTION 31 23 00 - EXCAVATION AND FILL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Requirements for excavation, rock excavation, structural backfill, embankment and grading. The Contractor shall comply with NYSDOT procedures, materials and methods.

1.2 RELATED SECTIONS

A. Section 02 61 13 Excavation, Removal and Handling of Contaminated Material

B. Section 02 32 19 Exploratory Excavation

1.3 CITED STANDARDS

A. American Society for Testing and Materials (ASTM):

1. C 33 Concrete Aggregates

2. C 117 Test Method for Material Finer than 75 um

3. C 136 Method for Sieve Analysis of Fine and Coarse Aggregates

4. D 422 Method for Particle – Size Analysis of Soils

5. D 1556 Method A, B, C or D Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures using 10 lb Rammer and 18-in. Drop

6. D 2922 Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Method

B. Title 29 Code of Federal Regulations, Part 1926, Safety and Health Regulations for Construction (OSHA)

C. New York State Department of Transportation (NYSDOT) Standard Specifications Section 203 – Excavation and Embankment

D. Other Test Methods - Materials tests and control methods not covered above shall be performed in conformance with the procedures contained in the appropriate NYSDOT publication in effect on the date of the advertisement for bids. These publications are available upon request to the NYSDOT website or the Director, Geotechnical Engineering Bureau.

1.4 NOTED RESTRICTIONS

A. NOT USED.

B. The Contractor shall utilize an independent testing laboratory, (provided by the Owner) to test each material proposed for use in backfilling.

C. Frequency of Tests (minimum):

1. Gradation: One test per 500 cubic yards stockpiled or in-place source material in accordance with ASTM C136, and ASTM C117. Each test shall be accompanied by a particle size distribution curve, similar to that required by ASTM D422 and coefficients of uniformly and concavity.

2. Moisture Contents: In the stockpile, excavation or borrow areas, a minimum of two tests per day per type of material or source of material being placed during stable weather conditions. During unstable weather, tests shall be made as dictated by local conditions.

3. Optimum Moisture and Maximum Density: Perform in accordance with ASTM D1557, Method C or D. Test shall be made for each type of material or source of material, including borrow material. One representative test shall be performed per 500 cubic yards of fill, backfill and bedding material, or when any change in material occurs which may affect the optimum moisture content or maximum density. Each test shall be accompanied by a gradation test performed in accordance with ASTM C136 and ASTM C117 (Procedure B), by a particle distribution curve similar to that required by ASTM D422 and coefficients of uniformity and concavity.

4. Backfill at Structures: One-in place compaction test for every 2,000 square feet and every 2 feet of added height during which material is placed. Perform compaction test in accordance with ASTM D1556. Structural backfill is not applicable for pile-supported structures.

5. Trench Backfill: One-in-place compaction test for every 300 linear feet for every two feet of added height, but not less than three compaction tests in any day during which material is placed. Perform compaction test in accordance with ASTM D1556.

6. See General Notes in Contract Drawings regarding requirements for design and construction of shoring.

1.5 QUALITY CONTROL

A. (None listed)

1.6 SUBMITTALS

The following items shall be submitted to the Engineer for approval.

A. Plan for field screening, segregating and stockpiling of contaminated soils.

B. Excavation procedure plan that includes methods of excavation, backfilling and testing.

C. Identity and qualifications of independent testing laboratory, provided by the Owner.

D. Compaction test results for in-place fills.

1.7 DELIVERABLES

A. (None listed)

PART 2 MATERIALS

2.1 CRITERIA AND DEFINITIONS

A. Unclassified Excavation. Unclassified excavation shall consist of the excavation and disposal of all materials, of any description, encountered in the course of construction, unless otherwise specified in the contract.

B. Embankment. The embankment is the portion of a fill section situated between the embankment foundation and the subgrade surface, excluding any material placed under another section of these specifications.

C. Embankment Foundation. The embankment foundation is the surface upon which an embankment is constructed after all work required under NYSDOT Standard Specification Section §203-3.09 has been completed.

D. Subgrade Surface. The subgrade surface is the surface of the road section upon which the select materials and/or subbase are placed.

E. Subgrade Area. The subgrade area is that portion of an embankment situated above either of the following, but excluding any material placed under another section of these specifications.

1. A line located 2 feet below the subgrade surface and extended to the intersection with the embankment side slopes, or

2. The embankment foundation, whichever is higher.

3. The material and compaction requirements for the subgrade area in embankments are found in NYSDOT Standard Specification Section §203-2.02 and §203-3.12, respectively.

F. Embankment Side Slope Area. The embankment side slope areas are those cross-sectional areas of an embankment situated outside of lines projected downward and outward on a one on one slope from the edges of the subgrade surface to their intersection with the embankment foundation, but excluding any portion lying within a subgrade area.

G. Suitable Material

1. A material whose composition is satisfactory for use in embankment construction is a suitable material. The moisture content of the material has no bearing upon such designation. In general, any mineral (inorganic) soil, blasted or broken rock and similar materials of natural or man-made (i.e. recycled) origin, including mixtures thereof, are considered suitable materials. Determinations of whether a specific natural material is a suitable material shall be made by the Engineer on the above basis.

2. Recycled materials that the NYSDOT has evaluated and approved for general use shall be considered to be suitable material for embankment construction subject to the conditions for use as determined by the NYSDOT.

3. The use of recycled materials must be also sanctioned by the Department of Environmental Conservation, usually in the form of a Beneficial Use Determination (BUD).

4. Glass from recycling facilities shall be considered suitable material for embankment construction.

5. Reclaimed Asphalt Pavement (RAP), and Recycled Portland Cement Concrete Aggregate (RCA) shall be considered suitable materials for embankment construction, subject to the following conditions for use:

   a. RAP - The Contractor shall provide and place RAP conforming to the requirements of NYSDOT Standard Specification Section 304.

   b. RCA-The Contractor shall provide and place RCA conforming to the requirements of NYSDOT Standard Specification Section 304.

H. Unsuitable Materials. Any material containing vegetable or organic matter, such as muck, peat, organic silt, topsoil or sod, that is not described above as suitable for use in embankment construction is designated as an unsuitable material. Man-made deposits of industrial waste, toxic or contaminated materials, sludge, landfill or other material is also unsuitable material.

I. Embankment Construction Control Devices. Furnish, install and maintain devices such as settlement gages, settlement rods, piezometers and other equipment in order to properly control earthwork construction.

J. Proof Rolling. Proof rolling consists of applying test loads over the subgrade surface by means of a heavy pneumatic-tired roller of specified design, to locate and permit timely correction of deficiencies likely to adversely affect performance of the pavement structure.

K. Graded Surfaces. The Contractor shall form and trim all graded surfaces to the lines and grades shown on the plans or as modified by the Engineer.

L. Select Granular Fill - Slope Protection. The Contractor shall excavate for, furnish, and install granular fill slope protection in accordance with these specifications, the NYSDOT Standard Sheets, conforming to the lines and grades shown on the plans, or where directed by the Engineer.

M. Applying Water. The Contractor shall furnish and apply water for dust control, for compaction purposes and for such other purposes and as directed by the Engineer. Water shall not be applied in inclement weather or when the temperature is below 32 degrees F.

2.2 MATERIALS

All processing operations, including washing, removal of oversize material, blending or crushing

shall be completed at the source of the material.

A. Subgrade Area Material. Subgrade area material shall consist of any suitable material having no particles greater than 6 inches in maximum dimension, unless Select Granular Subgrade with the well graded rock option is used. In that case, refer to NYSDOT Standard Specification Section 203-2.02 E. 1. A. If concrete is used, any exposed mesh or rebar shall not exceed 1 inch in length.

B. Embankment, Select Borrow and Select Fill

1. Gradation. Material furnished for these items shall be suitable material having no particles greater than 3 inches in maximum dimension. Of the portion passing the 4-inch square sieve, the material shall have the following gradation:

Sieve Size	Percent Passing by Weight		Sieve Size	Percent Passing by Weight
No 40	0 to 70		No 200	0 to 15

2. Soundness. The material shall be sound and durable. A material with a Magnesium Sulfate Soundness Loss exceeding 35 percent will be rejected.

3. Composition. RAP shall not be used.

C. Select Granular Fill and Select Structural Fill. Materials furnished under these items shall be suitable and conform to the following requirements:

1. Gradation. Except when used as backfill material for aluminum pipe with Type IR corrugations (Spiral Rib Pipe) or plastic pipe, the material shall have the following gradation:

Sieve Size	Percent Passing by Weight
4 inch	100
No 40	0 to 70
No 200	0 to 15

2. Soundness. The materials shall be substantially free of shale and soft, poor durability particles. A material with Magnesium Sulfate Soundness Loss exceeding 30% will be rejected.

3. Composition. RAP shall not be used.

4. pH. Where the State elects to test for this requirement, a material with pH of less

than 5 or more than 10 shall be rejected.

D. Select Granular Fill Slope Protection. Material furnished for use under this item shall consist of rock, stone, slag, cobbles, or gravel, substantially free of shale or other soft, poor durability particles.

1. Gradation

a. Broken or blasted unweathered rock used for this item shall be well graded, having no particles greater than 24 inches in maximum dimension, and substantially free from particles greater than 12 inches in maximum dimension, containing little or no material passing the No. 10 mesh sieve.

b. All materials, other than broken or blasted unweathered rock, shall meet the following gradation requirements:

Material Size	**Percent Passing by Weight**
24-inch maximum dimension	100
6-inch maximum dimension	90 to 100
2-inch square sieve	0 to 30
¼ inch sieve	0 to 10

c. Soundness. Where the State elects to test for this requirement, a material with a Magnesium Sulfate Soundness Loss exceeding 35 percent will be rejected.

E. Select Granular Subgrade.

1. Gradation

a. Well graded rock may be used for this item. Particles shall not exceed 12 inches in greatest dimension nor 2/3 of the loose lift thickness, whichever is less.

b. All materials, other than well graded rock, furnished under this item shall have no particles greater than 4 inch in maximum dimension. Of the portion passing the 4 inch square sieve, the material shall have the following gradation:

Sieve Size	**Percent Passing by Weight**

¼ inch	30 to 100
No 40	0 to 50
No 200	0 to 10

c. Soundness. A material with a Magnesium Sulfate Soundness Loss exceeding 35 percent will be rejected.

d. Composition. RAP shall not be used.

F. Glass

1. Gradation. Glass shall be crushed to a maximum particle size of ½ inch.

2. Characteristics. Glass may contain up to a maximum of 5 percent by volume of china, ceramics, plate glass products, paper, plastics or other deleterious materials. The material shall be subject to visual inspection by the Engineer and may be rejected based on this inspection. In case of rejection, the inspection must be documented in writing to the Engineer indicating the basis of rejection.

G. RAP

1. Gradation. RAP shall have a maximum top size of 2 inches at the time of placement.

2. Characteristics. RAP shall meet the requirements stated in NYSDOT Standard Specification Section 304.

H. RCA

1. Gradation. RCA shall meet the gradation requirements for the appropriate item of use.

2. Characteristics. RCA shall meet the requirements stated in NYSDOT Standard Specification Section 304, and the applicable parts of NYSDOT Standard Specification Section 203 herein.

I. Sand Backfill. Materials furnished under these items shall be suitable and conform to the following requirements:

1. Gradation. The material shall have the following gradation:

Sieve Size	**Percent Passing by Weight**

½ inch	100
¼ inch	90 to 100
No 200	0 to 5

2. Soundness. The materials shall be substantially free of shale and soft, poor durability particles.

3. pH. Where the State elects to test for this requirement, a material with pH of less than 5 or more than 10 shall be rejected.

J. Necessary fill material for cleaning, grading and shaping the existing roadside section shall conform to the requirements of NYSDOT Standard Specification Subsection 203-2.02A, Subgrade Area Material.

K. Sand for Pipes, Ducts and Conduit

1. Conform to NYSDOT Standard Specifications, Section 703-07, Concrete Sand.

L. Crushed Stone

1. Sound, durable crushed stone, conforming to NYSDOT Standard Specifications, Section 703-02, or NYSDOT Approved Recycled Material that meets the following requirements. The Recycled Material shall be tested as recommended by the Engineer.

Size Description No. 1 as follows:

Screen Size	% by Weight Passing
1 inch	100
½ inch	90-100
¼ inch	0-15

Size Description No. 2 as follows:

Screen Size	% by Weight Passing
1 ½ inch	100
1 inch	90-100
½ inch	0-15

or Size Description No. 4A as follows:

Screen Size	% by Weight Passing

3 inch	100
2 ½ inch	90-100
1 ½ inch	0-20

M. Pea Gravel

1. Washed crushed stone with angular particle size not less than 1/8" or more than ½". Dry density minimum of 95-lb/cu. ft. and no more than 5% passing the #8 sieve. (Per ASTM C33)

N. Gravel

1. Crushed stone with only one fractured face, size 3/8" as follows:

Screen Size	% by Weight Passing
½ inch	100
3/8 inch	90-100
#4	30-60
#8	0-10

O. Filter Fabric

1. Geotextile, Mirafi 160N or Engineer Approved Equal.

PART 3 EXECUTION

3.1 PREPARATION

A. Transmit submittals required by this Section. Furnish products as indicated.

B. Ensure substrates are in suitable condition to receive the work of this Section.

C. Protect facilities to remain. Locate underground utilities and service connections prior to commencing excavation work. Do not interrupt existing utilities unless permitted by the Owner. For utilities that shall be relocated, arrange for such relocation with appropriate utility companies.

D. Set and establish finish elevations and lines using existing established reference points. Preserve all established reference points, and if displaced, damaged or lost, replace them immediately.

E. Utility Location Protocol

1. The Contractor will identify the areas in which they plan to work in a Four-Week-Look-Ahead at the Bi-Weekly Progress Meeting.

2. On Monday of each week, the Contractor shall lay out the areas in which they plan to work the following week. These layouts will be in white to conform to the standard colors for locating utilities. Contractor will contact the underground utilities protective organization (Call-Before-U-Dig).

3. **Non-Power Utilities**: By 8:00 AM on Monday of the week following the Contractor's layout, the Owner will ensure that all non-power utilities within the area laid out by the Contractor have been marked out by the Owner. The utilities will be color coded in accordance with the standard colors for locating utilities. This includes Signals, Communications, and Structures. The Contractor and the Owner's field staff representatives will be present while utilities are marked out.

4. **Power Utilities**: The Contractor will lay out the power utilities based on the As-Built drawings and dig test pits to confirm the locations shown on the As-Builts. By 8:00 AM on Monday of the week following the Contractor's layout, the Power Department will have a representative on site to review the laid out areas with the Engineer and the Contractor. This representative will identify, if and where, any additional test pits need to be dug to verify/expose utility locations. Once the test pits confirm utility locations, the Contractor will be released to excavate in that area. If the utilities can not be located via the original test pit(s), the Power Department representative will coordinate with the Engineer to give further direction (if required) as to where to dig additional test pits. Under no circumstance will the Contractor excavate until the locations of the utilities shown on the as-built drawings in the area of work are confirmed.

5. The Contractor will mark all utilities that are found to be abandoned. This will facilitate future identifications in parallel trenches.

6. The Contractor shall adhere to all requirements of the contract documents pertaining to excavation and underground utilities. The Contractor is reminded of the requirement that all excavation equipment be properly grounded.

7. Standard Utility Colors:

   a. Red=Electric; Green=Sewer; Pink=Temporary Survey Markings; Orange=Communications/Signals

   b. White=Proposed Excavation; Blue=Water; Yellow=Gas/Oil

F. General - The Contractor shall remove all soil, rock, and other material, and utilize or dispose of these materials as required by the plans and specifications. All excavation and embankment work shall be executed as shown on the plans, except where directed by the Engineer, in writing, prior to performing the work.

All graded earth surfaces outside the roadway limits shall be smoothed and trimmed in reasonably close conformity (plus or minus 6 inches) of true grade. After trimming, the area shall be left in a compact and satisfactory condition, free of large stones or other objectionable materials, as determined by the Engineer.

Earthwork construction operations requiring compaction shall not be performed from November 1 thru April 1 except with written permission of, and under such special conditions and restrictions as may be imposed by the Engineer. Under no conditions will the contractor be permitted to place material that is frozen, or place fill material on frozen ground.

3.2 PUMPING, DRAINAGE AND DEWATERING:

A. Control surface water on site at all times. Dispose of such water in a suitable manner. Any discharge of groundwater shall be done with prior approval from NYSDEC and local agencies. Provide permits to the Owner in advance of any dewatering activities.Refer to state and local regulations for dewatering requirements.

C. If dewatering of a pipe trench is stopped before the backfill is placed over the pipe, the pipe shall be weighted down to prevent flotation.

3.3 EXCAVATION:

B. Perform excavation to the lines and grades as required. Sawcut pavement where required.

C. Excavated materials that cannot be used as fill or backfill shall be disposed of by the Contractor off the job site. Excavated soil fouled with petroleum, oil filters or other contaminants or hazardous materials shall be deemed unsuitable material and shall be stockpiled on site in an environmentally acceptable manner. The material shall be transported off site for disposal. Comply with applicable state requirements.

D. Original ground over which fills are to be placed shall be proof rolled with 4 passes using a 2-drum, 5-ton roller or equipment of equivalent capacity.

E. Protect soil beneath proposed foundations from disturbance and contamination.

F. Excavate for buildings and structures to required lines and grades so that foundations have slabs that bear on undisturbed subgrade.

G. When unsuitable materials are encountered at the design subgrades, remove such unsuitable material and replace with unclassified fill or structural backfill.

H. All excavation within four (4) feet (measured horizontally from the centerline) of the existing active utilities shall be hand excavation only.

3.4 EXCAVATION IN ROCK

A. Rock excavation may be anticipated in one area or more areas, and these areas can be approximately identified from the soil borings in the Geotechnical Report. Blasting will not be permitted.

B. If rock is encountered at the site during excavation, the Contractor shall notify the Engineer to confirm that rock is present (as opposed to a boulder or other hard object). The Contractor shall support the Engineer in determining if rock is present. If confirmed, the Contractor shall take appropriate survey points on the top of the rock in a grid approved by the Engineer. The Contractor shall also establish the bottom of the proposed excavation at each grid point so the Engineer can determine the amount of rock cut.

C. The Contractor shall submit a Rock Excavation Plan explaining how the rock will be excavated. The plan shall detail the equipment to be used, potential problems, safety concerns, and environmental concerns, including any noise related issues. Each problem or concern shall be addressed in the plan so that the work can be prosecuted safely. The plan shall be submitted to the Owner for approval prior to proceeding with the rock

excavation.

D. The Contractor shall excavate the rock. Maximum usage shall be made of the excavated rock. Rock that does not comply with this specification for reuse on the site shall be disposed of off-site in accordance with all applicable regulations.

3.5 EMBANKMMENT, FILLING AND BACKFILLING

A. Subgrade Area. Where a subgrade area is defined in an embankment by (NYSDOT Standard Specification Section) §(203-1.05, Subgrade Area, the material placed shall conform to NYSDOT Section §203-2.02A, Subgrade Area Material, placed and compacted in conformance with Section §203-3.10 and §203-3.12. Where longitudinal and transverse changes from cut to fill are encountered in the work, a subgrade transition section shall be provided in conformance with Standard Sheet "Earthwork Transition and Benching Details." Where a subgrade area becomes defined by §203-1.05 in a cut section, the materials placed and other details shall be as specified under §203-3.14C, unless otherwise required by the contract documents. Prior to subbase course placement, the surface on which the subbase is to be placed shall be thoroughly compacted to the satisfaction of the Engineer.

B. Embankment Foundation. After completion of the work required for Clearing and Grubbing, sod and topsoil shall be removed where the final pavement grade is 2 feet or less above the existing ground surface and in other areas designated in the plans or by the Engineer.

1. Prior to embankment construction and subbase course placement, the surface on which the embankment and/or subbase is to be placed shall be thoroughly compacted to the satisfaction of the Engineer. Unsuitable materials other than sod and topsoil shall be removed to the depths shown in the plans or as directed by the Engineer.

2. Where embankments are to be constructed over ground that will not adequately support embankment construction equipment, an initial layer of fill may be allowed to form a working platform. The need, manner of construction, and thickness of such a layer shall be subject to approval of the Engineer, and the layer will be permitted only where the lack of support is, as determined by the Engineer, not due to deficient ditching, grading or drainage practices or where the embankment could be constructed in the approved manner by the use of different equipment or procedures. Thicknesses of up to 3 feet may be permitted for such a layer. Concrete slabs may be used at the bottom of such a layer, provided they are placed horizontally.

3. In locations where embankments are to be constructed on hillsides or against existing embankments with slopes steeper than 1 (vertical) on 3 (horizontal), the slopes shall be benched. Required benches shall be constructed as shown on the NYSDOT Standard Sheet, "Earthwork Transition and Benching Details."

4. Where old pavement is encountered within 2 feet of the top of the subbase course, it shall be broken up or scarified.

C. Embankments. The embankment shall be constructed of suitable material.

1. Embankment material shall not be placed on frozen earth, nor shall frozen soils be placed in any embankments. Embankment material shall be placed and spread in lifts (layers) of uniform thickness, then uniformly compacted as specified under applicable portions of the Compaction section. During embankment construction operations, earth moving equipment shall be routed so as to prevent damage to any compacted lift. Damage to any compacted lift at any time during the course of construction, such as rutting under the loads imposed by earth moving equipment, shall be fully repaired by the Contractor prior to placement of any overlying materials. At the close of each day's work, the working surface shall be crowned, shaped and rolled with smooth steel wheel or pneumatic tired rollers, for positive drainage.

2. Particles with a dimension in excess of two-thirds of the loose lift thickness are designated as oversized particles. Oversized particles shall be removed prior to compaction of the lift and may be placed in the Embankment Side Slope Area.

3. Pieces of concrete may be used provided that the voids between the pieces are completely filled, and the greatest dimension of any piece does not exceed 2/3 the loose lift thickness. Exposed mesh or rebar shall not exceed 1 inch in length.

4. Embankments constructed using rock products or pieces of concrete shall be spread by bladed equipment on each lift to minimize the formation of large voids as the work progresses. The top lift of a rock or concrete fill shall be chinked.

5. When permitted by a note in the plans or proposal, stumps, logs, and other materials may be placed in the Embankment Side Slope Area provided that: 1) such matter is deposited and compacted concurrent with the adjacent embankment, and; 2) any stumps or woody material are covered by not less than 2 feet of soil beneath the exposed side slope surface.

6. Glass shall not be placed in contact with synthetic liners, geogrids, geotextiles or other geo-synthetics. Glass incorporated into embankments shall be thoroughly mixed with other suitable material so that Glass constitutes no more than 30 percent by volume anywhere in the embankment as visually determined by the Engineer-In-Charge.

D. General: Fill and backfill with structural backfill placed in loose lifts. Structural backfill shall be provided under roadway pavements, sidewalks, and wherever structural support is required. Place fill and backfill as promptly as work permits, but not until completion of the following:

1. Subgrade preparation resulting in a firm, stable subgrade including the replacement of any softened subgrade materials encountered during construction.

2. Approval of the construction below finish grade.

3. Recording final location and limits of any structure, utility or other underground feature that will be covered by backfill.

4. Concrete structures have been inspected and approved for backfilling.

5. Removal of concrete formwork, trash, debris, shoring and bracing.

6. Do not construct in freezing conditions unless approved by the Engineer.

7. Subgrade Preparation: Scarify subgrade soils a minimum 6 inches and compact to 90% of maximum dry density per ASTM D1557-Dry Density or proof roll.

E. Backfill to the required elevation and below roadway pavement and sidewalks. Use crushed stone, structural backfill or sand bedding in trenches and elsewhere.

1. Placement:

a. Place backfill materials in maximum 12-inch layers (depth per equipment used). Compact each layer in accordance with paragraph on Compaction.

b. In areas inaccessible to conventional compactors, or where maneuvering space is limited, approved impact rammers, plate or small drum vibrators, or pneumatic button-head compaction equipment may be used with layer thickness not to exceed 8” per equipment used before compaction.

c. Crushed Stone:

2. Place crushed stone and/or gravel for base courses in approximately 6-inch loose lifts and no density test with stone.

3.6 TRENCHING, BEDDING AND BACKFILLING FOR UTILITY LINES

A. General

1. Beddings of trenches shall be well drained and bottoms accurately graded. Hand dig bell holes and depressions for joints after the trench bottom has been graded.

2. Remove rock or boulders encountered in trench bottoms to the depth required to provide for a thoroughly compacted bed of approved bedding material, at least six (6) inches deep, in the trench bottom.

3. Pipe Bedding:

a. Extend bedding material 6 inches below the bottom of the pipe.

b. Place material in loose, uniform layers not over six (6) inches thick and compact to 95% of maximum dry density at optimum moisture content (ASTM D1556) whenever applicable for approved bedding material.

4. Backfilling

a. Do not backfill trenches until required open trench utility tests have been performed and approved. Backfill trench in maximum 6-inch layers and compact to the required density. Specific care must be exercised for

compaction within the haunch zone. For larger diameter pipe (>30”), backfill materials should be worked under haunches by hand.

3.7 COMPACTION

A. Comply with NYSDOT Standard Specification Section 203-3.12 for compaction and 203-3.13 and 203-3.14 for Proof Rolling.

B. General: Control compaction to provide minimum percentage of density specified, as determined by ASTM D1557, Method A. Field test in accordance with ASTM D1556 or D2922.

C. Density: Compact each layer of backfill material to the following minimum dry densities:

1.	Sand Bedding:	95%	
2.	Concrete Sand	95%	
3.	Structural Backfill and Fill		95%
4.	Unclassified Fill		90%
5.	Crushed stone or Gravel:		No density test required
6.	Select Borrow	90%	

D. Moisture Control

1. The moisture content of the material must be within the allowed limit for that type of material to allow maximum compaction.

3.8 MAINTENANCE:

A. Protect newly graded areas from traffic and erosion.

B. Repair and re-establish grades in settled, eroded and rutted areas.

3.9 TOLERANCE:

A. Top of subgrade shall not extend above the grade indicated in the plans.

3.10 DRAINAGE AND GRADING:

A. The Contractor shall provide and maintain slopes, crowns and ditches on all excavation and embankments to ensure satisfactory surface drainage at all times. Ditches and other drainage facilities necessary to remove ponded water shall be constructed as soon as practical to have the work area dry during the progression of work. All existing culverts and drainage systems shall be maintained in satisfactory operating condition throughout the course of the work. If it is necessary to interrupt existing surface drainage, sewers or under-drainage, then temporary drainage facilities shall be provided until the permanent drainage work is complete. Top-of-slope interceptor ditches, where shown on the plans,

shall be completed before adjacent excavation operations are begun. In earth cuts, the Contractor shall progress excavation operations in such a manner that the portion of the cut immediately adjacent to the design slope is at least 5 feet lower than the general level of the cut at all times until the lower payment line is reached.

B. The construction of these temporary drainage facilities shall be considered as incidental to the construction of the project and no additional payment will be allowed.

C. Any portion of an embankment or subgrade which has, in the opinion of the Engineer, been damaged by the Contractor's equipment during the course of construction, shall be repaired and recompacted by the Contractor to the satisfaction of the Engineer.

D. Where seepage causes instability of slopes, excavation and backfill or other corrective measures shall be performed as ordered by the Engineer and paid for under the appropriate item. Excavation for the installation of slope protection may be necessary at any time and location throughout the duration of the contract and may not necessarily coincide with the Contractor's performance of the general excavation work.

3.11 EMBANKMENT CONSTRUCTION CONTROL DEVICES

A. Settlement Gages and Settlement Rods. Settlement gages and rods shall be constructed, installed, and maintained where shown on the plans and in accordance with the details contained in the current publication issued by the Department covering construction, installation, maintenance, and abandonment of these devices.

B. Where settlement gages are called for, it will be the Contractor's option to install pipe gages or manometer gages, unless a definite type is specified on the plans or in the proposal. Settlement gages and settlement rods will be accepted for conformance with the specification requirements on the basis of an inspection of the installation by the Departmental Geotechnical Engineer.

C. Piezometers. Piezometers shall be constructed, installed, and maintained at the locations shown on the plans and in accordance with the detailed drawings and specifications included in the proposal.

END OF SECTION

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SECTION 312319 - DEWATERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes construction dewatering.

B. This Section also includes the use of cofferdams, as required to remove and divert water during the installation of culvert pipes near existing water sources.

1.2 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Furnish and install a dewatering system of sufficient size and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed.

1.3 QUALITY ASSURANCE

A. Perform work in accordance with the following Sections:
   1. Section 312000: Earth Moving
   2. Section 312500: Soil Erosion and Sedimentation Control.
   3. Section 315000: Excavation Support and Protection.

B. Regulatory Requirements: Comply with New York State Department of Environmental Conservation (NYSDEC) regulations for storm water pollution control before beginning dewatering.

C. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

2.1 COFFERDAMS

A. Contractor shall design and maintain the cofferdam in accordance with Section 5 of the NYSDEC regulations for storm water pollution control, and the project's SWPPP.

B. Contractor shall design and maintain the cofferdam for the intended use of the installation. Material options for cofferdams shall include:

   1. A commercially designed system manufactured specifically for the control of water.

   2. A system of temporary steel sheeting, meeting the requirements of ASTM A328M. Temporary steel sheeting may be used, provided that it is in suitable condition, as determined by the Owner's Representative.

3. Tightly sealed, impermeable sand bags may be used if demonstrated by the Contractor that it's application will be suitable for the height of water and type of flow. Sand bags shall be of a reinforced geotextile with ties. No burlap bags shall be used. Sand of gravel may be used as the fill material in the bags. Gravel shall meet the requirements of Type A4 or A5 Aggregate, as per Section 310516. Sand shall meet the requirements of Type A9 Aggregate, as per Section 310516. All materials used for sand/gravel bags shall be double bagged, inversely inserted and each bag individually tied to prevent leakage.

4. No soil laden water shall be in the cofferdam discharge.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide temporary grading to facilitate dewatering and control of surface water.

B. Monitor dewatering systems continuously.

C. Protect and maintain temporary erosion and sedimentation controls, which are specified in Division 31 Section "Site Clearing" during dewatering operations.

D. Install dewatering system utilizing pump equipment, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.
   1. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.
   2. Dewatering must be done so that the velocity of the discharged water doesn't cause scouring of the receiving area.
   3. Discharge water from dewatering pumps shall not be directly discharged without treatment to remove silt and velocity from the groundwater.

E. Provide an adequate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades.
   1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
   2. Maintain water table at least 2 ft below bottom of excavations at all times.

F. Cofferdams shall be maintained in a dewatered condition during foundation construction or culvert pipe and end section installation. The placement of foundation concrete shall not be impeded by water standing or flowing within the cofferdam.

Dewatering equipment and any additional bracing shall be of adequate quality and capacity and shall be so arranged as to permit their proper functioning in connection with the cofferdam. Dewatering equipment and bracing shall be so located to permit construction of the structure in accordance with the plans.

END OF SECTION 312319

SECTION 312500 – SOIL EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.1 Drawings and General Provisions of the Contract, including the Stormwater Pollution Prevention Plan (SWPPP) for this Project apply to this Section.

1.2 WORK INCLUDED

A. Installation of Erosion Control Facilities.

B. Inspection of Erosion Control Facilities.

C. Maintenance of Erosion Control Facilities.

D. Repairs to Erosion Control Facilities.

E. Removal and disposal of temporary erosion control facilities, where directed by the SWPPP.

1.3 REFERENCES

A. *New York Standards and Specifications for Erosion and Sediment Controls*, 2016 Version.

B. *New York State Stormwater Management Design Manual*, 2010. New York State Department of Environmental Conservation (NYS DEC).

C. *NYS DEC SPDES General Permit for Stormwater Discharges from Construction Activity,* Permit No. GP-0-20-001.

D. Stormwater Pollution Prevention Plan (SWPPP) for this Project.

1.4 REFERENCED REQUIREMENTS

A. Local (if applicable)

B. County (if applicable)

C. State - New York State Department of Environmental Conservation (NYSDEC)

D. Federal - United States Army Corps of Engineers (USACE)

1.5 ENVIRONMENTAL REQUIREMENTS/PROTECTION OF EXISTING FACILITIES

A. Protect the following:

1. Existing storm sewers

2. Existing drainage ways

PART 2 - PRACTICES

A. Refer to New York Standards and Specifications for Erosion and Sediment Controls, 2016 Version.

B. Refer to the Stormwater Pollution Prevention Plan (SWPPP) for this Project. The SWPPP is a part of the Contract Documents.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor is responsible for controlling sediment from leaving the project site. The Owner will have a qualified inspector perform weekly SWPPP inspections. Contractor to make any corrections that are noted in the SWPPP inspection reports.

B. Before beginning any work on-site, the Contractor shall become familiar with the SWPPP, and sign the required certifications that are in the SWPPP. Contractor shall keep a copy of the SWPPP on-site at all times.

B. Pollutants such as fuels, lubricants, bitumens, raw sewage, chlorine, and other harmful materials shall be handled and disposed of by approved methods and shall not be discharged into rivers, streams, impoundments, or into natural or man-made channels leading thereto. Washwater or waste from concrete mixing or curing operations shall not be allowed to enter live streams, etc.

C. In the event of a conflict between these specification requirements and pollution control laws, rules, or regulations of other federal, state, or local agencies, the more restrictive laws, rules, or regulations shall apply.

D. In case of repeated failures on the part of the Contractor to control pollution/erosion, the right shall be reserved by the Owner to employ outside assistance to provide the necessary corrective measures. Such incurred costs, plus related engineering costs, shall be charged to the Contractor and appropriate deductions made to the Contractor's progress payments.

3.2 INSTALLATION OF EROSION CONTROL FACILITIES

A. The installation of all erosion control facilities shall be in accordance with the SWPPP unless an alternative construction specification and installation detail has been provided or otherwise directed by the Consultant.

B. The location and method of construction of all erosion control facilities shall be the responsibility of the Contractor unless an erosion control plan and specifications are provided.

C. All erosion control facilities shall be installed prior to beginning any work unless a construction sequence has been provided. The erosion control

facilities will be installed in accordance with the construction sequence unless otherwise directed by the Consultant.

3.3 INSPECTION OF EROSION CONTROL FACILITIES

A. An inspection of all erosion control facilities shall be made by the Contractor at least once every seven calendar days and/or within 24 hours of the end of rain event where the total rainfall is 0.5 inches or greater whichever comes first or as otherwise specified. Inspections are further outlined in the Project SWPPP.

3.4 MAINTENANCE OF EROSION CONTROL FACILITIES

A. Maintenance of all erosion control facilities will be the Contractor's responsibility throughout the project, as outlined in the SWPPP.

B. Maintenance of all erosion control facilities must be provided after every inspection or as required.

C. Remove and dispose of temporary erosion control facilities as directed by the Engineer. Remove excess silt and/or debris as directed by the SWPPP.

3.5 REPAIRS TO EROSION CONTROL FACILITIES

A. All repairs to the erosion control facilities (temporary and permanent, as noted in the SWPPP inspection reports) shall be made by the Contractor at no cost to the Owner.

B. All repairs shall be made immediately upon notification by the Engineer, Qualified Inspector, or when the Contractor finds an erosion control facility not properly functioning or in need of repair or maintenance.

END OF SECTION 312500

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SECTION 315000 - EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes temporary excavation support and protection systems.

1.2 RELATED DOCUMENTS

A. 29 CFR 1926 Subpart P of “Safety and Health Regulations for Construction”, as administered by the Federal Occupational Safety and Health Administration (OSHA).

1.3 SUMMARY

A. Section includes temporary excavation support and protection systems.

B. Related Sections:

1. Division 31 Section 312000 "Earthmoving".
2. Division 31 Section 312319 "Dewatering" for dewatering system for excavations.

1.4 PERFORMANCE REQUIREMENTS

A. Design excavation support and protection system including comprehensive engineering analysis by a qualified Professional Engineer, as per Occupational Safety and Health Administration (OSHA) requirements.

B. Install and maintain excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.

C. Prevent surface water from entering excavation by grading, dikes or other means.

1.5 ACTION SUBMITTALS

A. Shop Drawings: For excavation support and protection system signed and stamped/sealed by a qualified Professional Engineer, including data analysis and calculations.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification data for qualified Professional Engineer and qualified Surveyor.

B. Videotape (or video files) and photographs showing existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by the absence of, the installation of, or the performance of excavation support and protection systems. Submit before Work begins.

C. Record drawings identifying and locating capped utilities and other subsurface structural, electrical, or mechanical conditions.

1.7 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to excavation support and protection system including, but not limited to, the following:
   a. Geotechnical report of soil boring logs and soil analysis.
   b. Existing utilities and subsurface conditions.
   c. Proposed excavations.
   d. Proposed equipment.
   e. Monitoring of excavation support and protection system.
   f. Working area location and stability.
   g. Abandonment or removal of excavation support and protection system.

1.8 PROJECT CONDITIONS

A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:

1. Notify Owner and Owner's Representative no fewer than four (4) days in advance of proposed interruption of utility.
2. Do not proceed with interruption of utility without Owner's written permission.

B. Project-Site Information: A geotechnical report consisting of soil borings and gradations on soil samples has been prepared for this Project and is available for information only. The opinions expressed in this report are those of the geotechnical investigation and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from the data. Advance additional borings and conduct other exploratory operations necessary for excavation support and protection.

C. Survey Work: Engage a qualified land surveyor to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

1. During installation of excavation support and protection systems, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify the Engineer if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that are either new or in serviceable condition.

B. Structural Steel: ASTM A 36, ASTM A 690, or ASTM A 992.

C. Steel Sheet Piling: ASTM A 328, ASTM A 572, or ASTM A 690; with continuous interlocks.

Corners shall be roll-formed corner shapes with continuous interlock.

D. Wood Lagging: Lumber, mixed hardwood, nominal rough thickness of 3 inches.

E. Cast-in-Place Concrete: ACI 301, of compressive strength required for application as determined by the Professional Engineer in the design calculation.

F. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

G. Tiebacks: Steel bars, ASTM A 722.

H. Tiebacks: Steel strand, ASTM A 416.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.

1. Shore, support, and protect utilities encountered.

B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, 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. Contractor to determine the applicable type of sheeting to utilize when the protection of adjacent trees and buildings that are directly adjacent to the trenching is required, as shown on the project plans.

C. Locate excavation support and protection systems clear of permanent construction so that forming and finishing of concrete surfaces are not impeded.

D. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure that excavation support and protection systems remain stable.

E. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.

3.2 TRENCH SHIELDS

A. If applicable and suitable for type of work, provide a trench box or trench shield system that meets OSHA requirements.

3.3 SOLDIER PILES AND LAGGING

A. Install steel soldier piles before starting excavation. Extend soldier piles below excavation grade level to depths adequate to prevent lateral movement. Space soldier piles at regular intervals not to exceed allowable flexural strength of wood lagging. Accurately align exposed faces of flanges to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.

B. Install wood lagging within flanges of soldier piles as excavation proceeds. Trim excavation as required to install lagging. Fill voids behind lagging with soil, and compact.

C. Install wales horizontally at locations indicated on Drawings and secure to soldier piles.

3.4 SHEET PILING

A. Before starting excavation, install one-piece sheet piling lengths and tightly interlock to form a continuous barrier. Accurately place the piling, using templates and guide frames unless otherwise recommended in writing by the sheet piling manufacturer. Limit vertical offset of adjacent sheet piling to 36 inches. Accurately align exposed faces of sheet piling to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment. Cut tops of sheet piling to uniform elevation at top of excavation it the sheet piling shall be a permanent structure.

3.5 TIEBACKS

A. Tiebacks: Drill, install, grout, and tension tiebacks. Test load-carrying capacity of each tieback and replace and retest deficient tiebacks.

1. Test loading shall be observed by a qualified professional engineer responsible for design of excavation support and protection system.
2. Maintain tiebacks in place until permanent construction is able to withstand lateral soil and hydrostatic pressures.

3.6 BRACING

A. Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.

1. Do not place bracing where it will be cast into or included in permanent concrete work unless otherwise approved by the Owner’s Representative.
2. Install internal bracing, if required, to prevent spreading or distortion of braced frames.
3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.7 REMOVAL AND REPAIRS

A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.

1. Fill voids immediately with approved backfill compacted to density specified in Division 31 Section 312000 "Earth Moving."

2. Repair or replace, as approved by Owner's Representative, adjacent work damaged or displaced by removing excavation support and protection systems.

END OF SECTION 315000

SECTION 321723 - PAVEMENT MARKINGS

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 painted markings applied to concrete pavement including the following:

1. Parking Striping
2. Traffic Arrows.
3. Accessibility International Symbol.

B. Related Requirements:
1. Section 099113 "Exterior Painting" for painting exterior concrete surfaces other than pavement.
2. Section 099600 "High-Performance Coating" for painting concrete surfaces other than pavement.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include technical data and tested physical and performance properties.

B. Shop Drawings: For pavement markings.

1. Indicate pavement markings, colors, lane separations, defined parking spaces, and dimensions to adjacent work.
2. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.
3. Indicate, with international symbol, spaces allocated for EV and compact cars.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of Hudson County and NJDOT for pavement-marking work.

1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

B. Verify compatibility of paint with all sealers, sealants, traffic coatings and all other materials of the surface to be painted.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 55 deg F for water-based materials, and not exceeding 95 deg F, and within approved products manufacturer's written instructions for acceptable temperature range for applications and curing period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following and or approved equal:
1. Benjamin Moore & Co.
2. M.A.B. Paints.
3. PPG Industries.
4. Sherwin-Williams Company (The).

2.2 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" the ABA standards of the Federal agency having jurisdiction and ICC A117.1.

2.3 PAVEMENT-MARKING PAINT

A. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II, with drying time of less than 45 minutes.

1. Color: As indicated.

B. Glass Beads: AASHTO M 247, Type 1 made of 100 percent recycled glass.

1. Roundness: Minimum 80 percent true spheres by weight.

C. VOC Content: Pavement markings used on building interior shall have a VOC content of 150 g/L or less.

D. Accessibility International Symbol character shall follow proportions as specified in ANSI A117.1-1986.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that pavement is dry and in suitable condition to begin pavement marking according to manufacturer's written instructions.

B. Coordination of Work: Review other Sections in which surface treatments are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers. Proceed with pavement marking only after unsatisfactory conditions have been corrected.

1. Notify the Architect of anticipated problems using the materials specified over substrates.

3.2 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Pavement marking paint shall not be placed until full cure of concrete sealer (generally, 14 days @ 70 degrees or higher) or bituminous pavement (generally, 30 days @ 45 degrees or higher) has been obtained.

C. Clean and prepare surfaces as required to remove all existing paint, surface treatment residue, oil, grease, laitance and other surface contaminants that could impair bond of paints. Pavement-marking paint shall be applied to clean, dry, sound substrates that are in accordance with the paint manufacturer's written installation requirements.

1. Acceptable cleaning and surface preparation methods include sweeping, blowing, and vacuuming.

2. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to pavement. Mask an extended area beyond edges of each stencil to prevent paint application beyond the stencil. Apply paint so that it cannot run beneath the stencil.
2. Broadcast glass beads uniformly into wet markings at a rate of 6 lb/gal.

E. Lay out all striping in accordance with the dimensions and details shown on the Drawings. Before starting, notify Architect of any discrepancies or interferences for actual field conditions. Contractor shall be responsible for removing paint and repainting any incorrect markings that would have been corrected by such notification.

3.3 FIELD QUALITY CONTROL

A. The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary during the period when pavement marking paint is being applied:

1. The Owner will engage the services of an independent testing agency to sample the paint material being used. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.
2. The testing agency will perform appropriate tests for the following characteristics as required by the Owner:

    a. Quantitative materials analysis.
    b. Apparent reflectivity.
    c. Washability.
    d. Accelerated weathering.
    e. Dry opacity.
    f. Color retention.

3. If test results show material being used does not comply with specified requirements, the Contractor may be directed to stop painting, remove noncomplying paint, pay for testing, repaint surfaces coated with rejected paint, and remove rejected paint from previously painted surfaces if, upon repainting with specified paint, the two coatings are incompatible.

3.4 PROTECTING AND CLEANING

A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.

B. Protect pavement markings from damage and wear during remainder of construction period.

C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

D. Provide "Wet Paint" signs to protect newly painted finishes.

END OF SECTION 321723

SECTION 329113 – SOIL PREPARATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the Work of this Section.

C. Coordinate work with that of all other trades affecting or affected by work of the Section. Cooperate with such trades to assure steady progress of all work under the Contract.

1.2 SCOPE OF WORK

A. This Section specifies administrative and procedural requirements for planting soil including, but not limited to the following:

1. Soil amendments.
2. Soil preparation for imported soils including testing for conformance.
3. Subgrade testing.
4. Installation and placement of soils.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 31 Section “Site Clearing” for stripping and stockpiling topsoil and for protection of existing trees and planting.
2. Division 31 Section “Soils for Earthwork” for bioretention soil mix.
3. Division 32 Section “Earth Moving” for excavation, filling, rough grading, and backfill.
4. Division 32 Sections “Turf and Grasses” and “Plants” for planting soil mix placement.

C. Coordinate activities with other project contractors so that there is no soil disturbance from traffic or other construction activities subsequent to placement.

1.3 REFERENCES

A. ANSI: American National Standards Institute.

B. AOAC: Association of Official Agricultural Chemists.

C. ASA: American Society of Agronomy.

D. ASTM: American Society for Testing Materials.

E. USDA Soil Texture System of Classification.

1.4 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Finish Grade: Elevation of finished surface of planting soil.

C. Planting Soil: Stockpiled or imported topsoil and/or subsoil mixed with soil amendments for planting trees, shrubs, ground covers and lawn.

D. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill.

E. Subsoil: All soil beneath the topsoil layer of the site soil profile, and typified by the lack of organic matter and soil organisms. Subsoil is unsuitable for plant growth unless amended as specified.

F. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.

1.5 SUBMITTALS

A. Sources for Soil Components and Planting Soil Mixes: Submit information identifying sources for all soil components and the firm responsible for mixing of planting soil mixes.

1. Soil mix supplier shall have a minimum of five years' experience at supplying custom planting soil mixes.
2. Submit supplier name, address, telephone and fax numbers and contact name.
3. Submit certification that accepted supplier is able to provide sufficient quantities of materials and mixes for the entire project.

B. Samples: Prior to installing soil mixes, submit representative samples to Landscape Architect for approval. Do not place any soil mixes until Landscape Architect's approval has been obtained.

1. Imported loam soil mix.

C. Compost:

1. Product Data: For each type of product indicated, including source.

2. Certificates: Provide certificates required by authorities having jurisdiction, especially for any composted materials containing sewage sludge. Approval as EPA Type 1 “exceptional quality” is required as well as that of the State of New York.
3. Testing: As described in Quality Assurance.

D. All Other Amendments: Product Data.

E. Subgrade Testing:

1. Field percolation test results as described in Part 3 Execution. Percolation tests shall be measured in inches per hour of drainage.

F. Imported Planting Soil Mixes: The following testing is required of all soil mixes comprised of imported soil materials:

1. Particle Size Analysis: Include sand, silt and clay, sand size distribution, sand particle shape, pH, uniformity coefficient by hydrometer method (ASTM D-422-63).
2. Organic Matter: Percent organic matter by combustion (ASTM F-1647, Method 1).
3. Report suitability of soil mixes for turf and plant growth. Verify compliance with recommended quantities of nitrogen, phosphorus, potassium, nutrients and soil amendments to be added to produce satisfactory topsoil.
4. Test results for soil mixes must be accepted prior to placement.

1.6 QUALITY ASSURANCE

A. Source Limitations for Topsoil and Planting Soil Mix: Obtain all topsoil and/or planting soil mix through one source that has been tested according to the requirements below. If there are any additional proposed sources, Contractor must provide topsoil analysis and testing for each source as described below.

B. Sources for Soil Components and Planting Soil Mixes: Submit information identifying sources for all soil components and the firm responsible for mixing of planting soil mixes.

1. Landscape Architect shall have the right to reject any soil supplier.
2. Soil mix supplier shall have a minimum of five years’ experience at supplying custom planting soil mixes.
3. Submit supplier name, address, telephone and fax numbers and contact name.

C. Submit certification that accepted supplier is able to provide sufficient quantities of materials and mixes for the entire project.

D. Soil Management Plan: Prior to commencement of site work, submit an approved copy of the project Soil Management Plan with an attached implementation schedule.

E. Soil-Testing Laboratory Qualifications: The Contractor shall engage an independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

F. Percolation Testing of Subgrade: Prior to placement of the planting soil, test the subgrade as described in this Section. Coordinate the testing of the subgrade for percolation with the Sitework Contractor, Soil Scientist, and Landscape Architect.

1.7 DELIVERY, STORAGE AND HANDLING

A. Material should not be handled or hauled, placed or compacted when it is wet as after a heavy rainfall or is frozen. Soil should be handled only when the moisture content is less than at field capacity. The Landscape Architect shall be consulted to determine if the soil is too wet to handle.

B. Store and handle packaged materials in strict compliance with manufacturer's instructions and recommendations. Protect all materials from weather, damage, injury and theft.

C. Sequence deliveries to avoid delay. On-site storage space is permissible only with written notice from Construction Manager. Deliver materials only after preparations for placement of planting soil have been completed.

D. Prohibit vehicular and pedestrian traffic on or around stockpiled planting soil.

E. Soil that is to be stockpiled longer than two weeks, whether on or off site, shall be placed in mounds less than six feet high. If soil stockpiles greater than six feet high are present longer than two weeks then the contractor shall break down and disperse soil so that mounds do not exceed the six foot height restriction for longer than two weeks.

1. Provide silt fencing around topsoil mounds, and/or as directed in the Storm Water Pollution Prevention Plan (SWPPP).

F. Vehicular access to the site is restricted. The Contractor shall include proposed routing for deliveries and site access in the Soil Management Plan.

G. Soil materials shall not be handled or hauled, placed or compacted when it is wet, as after a heavy rain, nor when frozen. Soil shall be handled only when the moisture content is less than field capacity.

H. Provide delivery tickets for soil amendments to verify the quantity of material specified on the Soil Management Plan. Make corrections and adjustments as directed by the Landscape Architect.

PART 2 - PRODUCTS

2.1 TOPSOIL

A. Stockpiled Topsoil: Prior to commencement of Work, the Contractor shall strip and stockpile existing site topsoil for reuse.

1. Screen soil free of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
2. Supplement with imported or manufactured topsoil from off-site sources when on-site quantities are insufficient. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches (100 mm) deep; do not obtain from agricultural land, bogs or marshes.

B. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 4 percent organic material content; clean and screened free of deleterious materials and weeds, including but not limited to any plant listed by NYSDEC or other authority as invasive, nuisance or noxious weed species; and free of stones 1 inch (25 mm) or larger in any dimension and other extraneous materials harmful to plant growth.

1. Topsoil Source: Import topsoil or manufactured topsoil from off-site sources only if required due to deficit of existing soil materials. Obtain topsoil displaced from naturally

   well-drained construction or mining sites where topsoil occurs at least 4 inches (100 mm) deep; do not obtain from agricultural land, bogs or marshes.

2.2 SOIL AMENDMENTS

A. Sand: Refer to Section 310516 Aggregates for Earthwork.

B. Compost: Well-composted, stable, and weed-free organic matter not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings. The compost shall be a dark brown to black color and be capable of supporting plant growth with appropriate management practices in conjunction with addition of fertilizer and other amendments as applicable, with no visible free water or dust, with no unpleasant odor, and meeting the following criteria as reported by laboratory tests. **Debris such as metal, glass, plastic, wood (other than residual chips), asphalt or masonry shall not be visible and shall not exceed one percent dry weight**.

1. Organic Matter Content: 50 to 60 percent of dry weight. (ASTM F-1647, Method 1).
2. The ratio of carbon to nitrogen shall be in the range of 10:1 to 25:1.
3. One hundred percent of the material shall pass a 3/8-inch (or smaller) screen. (ASTM D- 422-63).
4. pH: The pH shall be between 6.8 to 7.2 as determined from a 1:1 soil-distilled water suspension using a glass electrode pH meter. (American Society of Agronomy *Methods of Soil Analysis*, Part 2, 1986).

5. Salinity: Electrical conductivity of a one to two soil to water ratio extract shall not exceed
   4.0 mmhos/cm (dS/m).
6. Heavy metal contents shall conform to state and federal regulations.
7. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source- separated or compostable mixed solid waste.

C. Compost may be obtained at one of the following sources, provided that the test requirements are met:

1. WeCare Compost by We Care Organics, Jordan, New York, 315-689-1937
2. Cayuga Compost (fine) by P&S Excavating, Trumansburg, New York, 607-387-6826
3. Cornell Farm Services, Ithaca, NY: 607-257-2235
4. CJ Krantz Organics, Clarence Center, NY, 716-741-3850
5. Fessenden Farms, King Ferry, NY, 877-767-7280
6. Approved equivalent.

2.3 FERTILIZER

A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 10 percent phosphoric acid.

B. Superphosphate: Commercial, phosphate mixture, soluble; a 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 formaldehyde, 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 or pelleted 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.

2.4 IMPORTED PLANTING SOIL MIX

A. Planting soil mix shall be a loam as defined by USDA Soil Texture System of Classification created from combination of accepted sand, topsoil, and compost meeting the following criteria:

1. Free of stones over 1/2”, stumps, roots or other woody material over 2” in diameter
2. Free of brush and seeds from noxious weeds.

3.	Sand content	25% to 50% by volume
4.	Silt	30% to 50% by volume
5.	Clay content	50% to 80% by volume
6.	Permeability	>1” inch per hour
7.	pH	6.8 to 7.2
8.	Organic Matter	Minimum 5.0%
9.	Magnesium	35 lbs.s per acre, minimum
10.	Phosphorus (P2O5)	75 lbs. per acre, minimum
11.	Potassium (K2O)	85 lbs. per acre, minimum
12.	Soluble salts	<500 ppm

B. Provide test results from a certified soil scientist confirming that soil mix conforms to the characteristics as outlined above.

C. Weight of Slow-Release Fertilizer per 1000 Sq. Ft. (92.9 Sq. m): As recommended by manufacturer, based on rates supplied by Soil Scientist.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Pre-Installation Examination Required: The Contractor shall examine previous work, related work, and conditions under which this work is to be performed and shall notify Landscape Architect in writing of all deficiencies and conditions detrimental to the proper completion of this work. Beginning work means Contractor accepts substrates, previous work, and conditions. The Contractor shall not place any planting or turf soil mix until all work in adjacent areas is complete and approved by the Landscape Architect.

B. Examination of Subgrade: The subgrade shall be inspected prior to the start of soil placement for conformance with the Drawings for elevations of subgrade relative to finish grade. Subgrade shall be graded smooth and parallel to the finish grades unless otherwise noted in the Drawings.

C. Pre-Grading Inspection: Prior to the commencement of Work, contact the Landscape Architect to provide an inspection to verify the delineation areas on the Soils Management Plan and proposed location(s) for topsoil and material stockpiling. Make corrections and adjustments as directed by the Landscape Architect prior to commencing any work.

3.2 SUBGRADE DRAINAGE TESTING

A. Perform subgrade percolation testing at a frequency of one percolation test for every 1,000 sq. ft. of installed topsoil area and at all bioretention planting beds. Percolation tests shall be performed on a minimum of 10% of tree pits and 20% of shrub beds, and on any areas of questionable drainage or as required by Landscape Architect. Contact Landscape Architect and conduct percolation tests in his or her presence. Percolation tests shall be measured in inches per hour of drainage at the base of the plant root level.

1. Excavate test pits 36” by 36” by 18” deep.
2. Fill test pit with 12” minimum depth water and allow water to naturally drain out. When water has drained out, fill excavation again with 12” minimum depth water and measure rate of drainage. Drainage rate should be a minimum of 1” per hour (1 inch drop in water elevation per hour test pit).
3. Should any planting areas yield a percolation test result of less than 1” of drainage per hour, stop work on these areas and obtain direction from Landscape Architect prior to installation of planting mixes and amendments.

3.3 MIXING OF SOIL MIXES

A. General Soil Mix Preparation: Examine soil and remove foreign materials, stones over 1/2”, and organic debris over 2” in length. All preparation and mixing shall be accomplished when the soil moisture content is less than field capacity.

B. Adequate quantities of mixed planting soil materials shall be provided to attain, after compaction and natural settlement, all design finish grades.

1. Minimum depths of mixed soils must be achieved per planting details. Contractor shall remove excess soils from site as needed at no additional cost.

C. Soil mixes shall be produced with equipment that blends together each component in a thorough and uniform manner.

1. Soil mixing can occur in-place or off-site.

3.4 SOIL PREPARATION TECHNIQUES

A. Protection of Existing Soils: Protect existing in-place soils and vegetation.

1. Applicability: All areas within the Project Limit Line that are to remain undisturbed by all construction activities including topsoil stripping, grading, excavation, backfill, staging and stockpiling shall be protected by the following:

a. Enclose area with chain link protection fence. Fence line shall be maintained throughout the duration of the Work.
b. Provide continuous 3” layer of shredded bark mulch at commencement of site work. Layer of mulch shall remain undisturbed throughout the duration of the Work.
c. Upon completion of site work, Contractor shall rototill shredded bark mulch into soil, avoiding tree roots.
d. Contractor shall establish lawn or planting beds as directed in the Landscape Plan.

B. Imported Planting Soil Mix: Import topsoil and amend to achieve a loam as defined by the USDA Soil Texture System of Classification.

1. Applicability: All areas designated for lawns and planting beds that need additional material to achieve finish grades.
2. Contractor shall manufacture planting soil mix as follows:

    a. Contractor shall procure all soil component materials.
    b. Contractor shall obtain laboratory testing services to determine percentages of soil component materials required to manufacture planting soil mix.
    c. Mix in fertilizers and amendments as recommended by soil testing laboratory and as approved by the Landscape Architect. If lime is to be added, it shall be mixed with dry soil before fertilizer is added and mixed.
    d. After component percentages are determined by the Soil Scientist, each planting soil mix shall be tested for physical and chemical analysis.
    e. Retest mixed planting soil and adjust mix as necessary to meet project requirements.

3. Placement: Scarify or till subgrade to depth needed to achieve required depth of planting or turf soil mix after amending. Entire surface shall be disturbed by scarification. Do not scarify within drip line of existing trees.
4. Rake beds to fine grade and remove surface rocks larger than 2 inches in diameter.

    a. In turf areas, roll to compact soil to 85% of maximum density and remove rocks and debris greater than 1 inch in diameter.

3.5 COORDINATION AND EXCESS MATERIALS

A. Coordinate activities with other project contractors so that there is no soil disturbance from traffic or other construction activities subsequent to soil placement.

B. Excess Soil Materials: Remove the excess soil materials from the site at no additional cost to the Owner unless otherwise requested.

1. Owner shall reserve right of first refusal on all amended soil mixes.

3.6 FIELD QUALITY CONTROL

A. Post-Installation Inspection: Prior to planting, contact the Landscape Architect to provide an inspection verify that the placement of amendments and soil preparation is consistent with the Soil Management Plan.

1. Contractor and Landscape Architect shall verify depth of imported planting soil placement and/or rototilled amended soil depth prior to

installation of plants.

2. If required depth is not achieved, Contractor shall provide additional rototilling, mixing and compost to achieve specified depth at no cost to the Owner.

END OF SECTION 329113

SECTION 330500 - COMMON WORK RESULTS FOR UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Piping joining materials.
2. Piping system common requirements.

1.2 DEFINITIONS

A. Exposed Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.

B. Concealed Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 ACTION SUBMITTALS

A. As per the Material Specification.

1.4 INFORMATIONAL SUBMITTALS

A. As per the Material Specification.

PART 2 - PRODUCTS

2.1 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch (3.2-mm) maximum thickness, unless otherwise indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

D. Solvent Cements for Joining Plastic Piping:

1. ABS Piping: ASTM D 2235.
2. CPVC Piping: ASTM F 493.
3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
4. PVC to ABS Piping Transition: ASTM D 3138.

E. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Install piping according to the following requirements and utilities Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on the Coordination Drawings.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping to permit valve servicing.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Select system components with pressure rating equal to or greater than system operating pressure.

I. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

1. A wall pipe or sleeve will be required for all pipe passing through concrete or masonry block walls. Wall fittings and sleeves shall be as indicated on the Drawings and as specified in the applicable piping Specification Section.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and utilities sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 appendixes.
3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
5. PVC Nonpressure Piping: Join according to ASTM D 2855.
6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.

E. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

F. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

G. Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

H. Concrete collars: Areas of dissimilar pipe connections or spot repairs on pipes may require an exterior concrete collar, as noted on the plan and associated detail. Concrete that is cast for the collar shall extend around the entire perimeter of the pipe, such that it will bear onto undisturbed ground below the pipe.

END OF SECTION 330500

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SECTION 330526 – UTILITY IDENTIFICATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Warning Tape to be placed in utility trenches.

B. Related Sections:
1. Division 31 Section 312000 “Earth Moving” for utility trench excavation.

C. Work Included:

BP-1

The Work included in this section shall pertain to the identification of potable water, fire protection water, buried in the site. The work shall also include but not be limited to the installation of identification/warning tape, copper tracing wire at non-ferrous utility pipes (as confirmed with the Owner’s Representative), and color coding on pipe.

BP-2

The Work included in this section shall pertain to the identification of potable water, fire protection water, and gas buried piping, underground electric, underground communication, buried in the site. The work shall also include but not be limited to the installation of identification/warning tape, copper tracing wire at non-ferrous utility pipes (as confirmed with the Owner’s Representative), and color coding on pipe.

PART 2 - PRODUCTS

2.1 IDENTIFICATION/WARNING TAPE

A. General: Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

1. Potable and Fire Protection Water Main Tape:
   a. Color: Blue with Black Lettering
   b. Lettering: “CAUTION: WATER LINE BURIED BELOW” or similar wording.

2. Gas Main Tape:
   a. Color: Yellow with Black Lettering
   b. Lettering: “CAUTION: GAS MAIN BURIED BELOW” or similar wording.
3. Sanitary Sewer Main Tape:
   a. Color: Green with Black Lettering

b. Lettering: “CAUTION: SANITARY LINE BURIED BELOW” or similar wording.

4. Storm Sewer Main Tape:
   a. Color: Green with White Lettering
   b. Lettering: “CAUTION: STORM LINE BURIED BELOW” or similar wording.

5. Underground Electric Tape:
   a. Color: Red with Black Lettering
   b. Lettering: “CAUTION: ELECTRIC LINE BURIED BELOW” or similar wording.

6. Telephone or Communications Tape:
   a. Color: Orange with Black Lettering
   b. Lettering: “CAUTION: COMMUNICATIONS BURIED BELOW” or similar wording.

All lettering on the warning tape shall appear legibly on the tape and shall run the entire length of the pipe.

B. TRACER WIRE FOR GAS LINES

1. In addition to providing a warning tape with an encased metallic core, all underground gas lines shall have a continuous, insulated 12 gauge solid copper wire, installed directly on top of the centerline of pipe for locating. Tracer wire shall be color coded yellow below the thermoplastic insulation recommended for direct bury. Wire connectors shall be water tight to provide electric continuity. Fasteners at structures to ground level shall be made of non corrosive material.

PART 3 – EXECUTION

3.1 INSTALLATION OF IDENTIFICATION/WARNING TAPE:

A. Install warning tape directly over the piping (both ferrous and non ferrous), as shown in the Project Drawings.

B. Install warning tape above the outside edge of the related utility structure, such that the warning tape is placed 24 inches below grade or a minimum of 12 inches above the structure. Do not embed warning tape within any asphalt or concrete pavements.

3.3 INSTALLATION OF TRACER WIRE

A. Tracer wire shall be installed along all new non-ferrous pipes and conduits, with the exception of sanitary and storm sewer lines. The wire shall be installed directly above the respective utility and shall be placed in such a manner as to be able to properly trace all utility pipe/conduits without loss or deterioration of the signal or without the transmitted signal migrating off the tracer wire.

B. A yellow-insulated copper tracer wire or other *approved* conductor, or a product specifically designed for that purpose, shall be installed adjacent to underground nonmetallic *piping*. Access shall be provided to the tracer wire or the tracer wire shall terminate above ground at each end of the nonmetallic *piping*. The tracer wire size shall be not less than 18 AWG and the insulation type shall be suitable for direct burial.

C. Except for approved splice locations, tracer wire shall be continuous and without splices from each trace wire point.

END OF SECTION 33052

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SECTION 331116 - WATER UTLITY PIPING

PART 1 - GENERAL

1.1 WORK INCLUDED

This section covers the furnishing and installation of 4 through 24 inch buried ductile iron (DI) pressure pipe for Domestic, Potable Water Services Lines. DI pressure pipe shall be furnished complete with all fittings, jointing materials, anchors, blocking, encasement, and other necessary appurtenances (including valves and hydrants).

In addition to coordination with the Owner's Representative, all water related work shall be reviewed and approved by the Health Department prior to any final connection work. All pressure tests and disinfection testing is subject to the approval of the Health Department.

AWWA C-150 DI Water Pipe shall be furnished where indicated on the drawings, the water main replacement work (labeled "W" on the plans), includes the following items:

A. Ductile Iron (DI) cement lined pressure water pipe for the replacement of water mains as part of this Project.

B. Corporation cocks, curb boxes and stops, tapping sleeves, and service clamps.

C. Tapped connections consisting of connections made to the proposed Ductile Iron Pipeline and existing pipe by means of the threaded or bolted attachment of a corporation cock or valve to the pipe.

D. Pipe fittings and appurtances

E. Polyethylene encasement of ductile iron water lines.

F. Pipeline Pressure and Leakage Testing

G. Related Documents:

- Section 312000 Earth Moving
- Section 312500 Soil Erosion and Sedimentation Control
- Section 331300 Cleaning and Disinfection of Water Distribution Systems
- Section 330500 "Common Work Results for Utilities".

1.2 REFERENCES

A. AWWA C150 DI Pressure Pipe and Fabricated Fittings, for Water Distribution

B. AWWA C104 / ANSI A21.4 - Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water; as well as AWWA C105 / ANSI A21.5 - Polyethylene

Encasement for Ductile Iron Pipe Systems

C. AWWA C110 / ANSI A21.10 - Ductile Iron and Grey Iron Fittings 3-inches through 48- inches for Water

D. AWWA C111 / ANSI A21.11 - Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings

E. AWWA C 151 / ANSI A21.51 - Ductile Iron Pipe, Centrifugally Cast for Water

F. AWWA C 153 / ANSI A21.53 - Ductile Iron Compact Fittings, 3-inches through 24 inches for Water

G. ASTM A536 – Standard Specification for Ductile Iron Castings

I. AWWA C600 - Installation of Ductile Iron Water Mains and Their Appurtenances

J. AWWA C800 – Underground Service Line Valves and Fittings

K. AWWA M44 – Distribution Valves

L. New York State Department of Health, Bureau of Public Water Supply Protection – Guidelines for Designing Backflow Prevention Assembly Installations, Supplement to the 1981 Cross Connection Control Manual.

M. New York State Department of Transportation (NYSDOT) Standard Sheet 663-01thru 07 (Water Main Pipe Installation Details), as well as details included in the contract drawings.

1.3 SHOP DRAWINGS

A. Submit detailed Shop Drawings and/or catalog cuts and data on all Ductile Iron Pipe and Fittings which are proposed to be used in the work. Certified copies of the manufacturer's affidavit stating that pipe and fittings were manufactured and tested in accordance with applicable provisions in the above-specified Standards shall be submitted. Prior to obtaining any material in connection with this Section, detailed shop drawings, installation guides, and data on pipes, fittings, couplings, supports, anchors, bolts, nuts, and other necessary accessories shall be submitted.

B. For the 2 inch waterline and appurtenances, the Contractor shall submit to the Owner’s Representative, for review, detailed Shop Drawings and/or catalog cuts and data on all corporation cocks, curb stops and boxes, tapping sleeves, service clamps, and other appurtenances relating to a tapped connection.

C. Material to be in accordance with NYSDOT Approved List

PART 2 - PRODUCTS

2.2 MATERIALS

Pipe	AWWA C150 DI Pipe. Thickness Class 52
Fittings	Cast iron; ANSI/AWWA C110/A21.10, 250 psi pressure rating, except shorter laying lengths will be acceptable.
Joints:	
PVC to PVC	ANSI/AWWA C900 or C905, stab type, with elastomeric synthetic rubber gaskets. Gaskets of natural rubber will not be acceptable.
HDPE to Ductile Iron	Fully Restrained, Solid Sleeve (Ductile Iron) with HDPE – Mechanical Joint Adapter to Connect to Ductile Iron (DICL) Pipe. Coupling to meet the requirements of AWWA C219, and other requirements as noted below: Retained Rings – ASTM A536 (Ductile Iron) Coupling Sleeve – ASTM A536 (Ductile Iron) Threaded Rods and Nuts shall be Corrosion Resistant, Low Alloy, High Strength Steel per ANSI/ AWWA C111/A21.11
PVC to Cast Iron	ANSI/AWWA C111/A21.11, except gaskets shall be synthetic rubber. Natural rubber will not be acceptable.
Tapping Saddles	Ductile iron, with galvanized steel straps and synthetic rubber sealing gasket, 250 psi pressure rating.
Restrained Joints	ASTM F1674, EBAA Iron 2000 series (4 inch through 20 inch) or concrete thrust blocking.
Tapping Sleeves	Ductile iron, 250 psi pressure rating.
Polyethylene Encasement	Tube or sheet, ANSI/AWWA C105/A21.5.
Joint Tape	Self-sticking, PVC or polyethylene, 10 mils thick; Chase "Chasekote 750", Kendall "Polyken 900", or 3M "Scotchrap 50".
Coal Tar Epoxy	High-build coal tar epoxy; Ameron "Amercoat 78HB Coal Tar Epoxy", Carboline "Bitumastic 300 M", Tnemec "46H-413 Hi-Build Tneme-Tar", or Sherwin-Williams "Hi-Mil Sher-Tar Epoxy".
Conductive Tracer	Detection tape, 3 inches wide; aluminum foil core, 0.5 mil thick, encased in a protective inert plastic jacket; 5,000 psi min tensile strength; 2.5 lbs per inch per 1,000 feet min mass; color coded in accordance with APWA Uniform Color Code; Allen Systems "Detectatape", Lineguard "Type III", or Reef
	Industries "Terra Tape D".

Ductile Iron Pipe: Ductile Iron Pipe shall be pressure class of 350 or thicker, and the cement lining shall be double cement lining as required by the OHM Engineering Guidelines.

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

a. U.S. Pipe Co.
b. EBAA Iron, Inc.
c. McWane Ductile, Inc.

Ductile Iron Pipe Joints:
The use Push-on Joints and Mechanical Joint are permitted in accordance NYSDOT Standard Sheet 663-01thru 07.

2. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end.
3. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
4. Gaskets: AWWA C111, rubber.
5. Mechanical joints may be used for closures, subject to meeting thrust restraint requirements, or as shown on the Contract Drawings. Mechanical joints shall be assembled in accordance with AWWA C111. Mechanical joints to be made with restraining glands shall be installed in compliance with manufacturer's recommendations.
6. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or equal:
   a. U.S. Pipe Co.
   b. EBAA Iron, Inc.
   c. McWane Ductile, Inc.

Ductile Iron Fittings

1. Fittings for buried ductile iron pipe shall be ductile iron with mechanical joint unless indicated otherwise on the Contract Drawings. Mechanical joint fittings shall be compact body, manufactured and tested in accordance with AWWA C-153.
2. The pressure class for all fittings shall be 350 psi.
3. Mechanical joints for fittings shall be in accordance with AWWA C-111. The required joint accessories including ductile iron glands, high strength low-alloy steel tee bolts
   and nuts, plain backed rubber gaskets, and joint lubricant shall be supplied by the pipe manufacturer.
4. As manufactured by U.S. Pipe, or equal, Subject to compliance with requirements.

Gate Valves

1. Nonrising-Stem, High-Pressure, Resilient-Seated Gate Valves:
   a. Description: Ductile-iron body and bonnet; with bronze or ductile-iron gate, resilient seats, bronze stem, and stem nut.
      1) Standard: AWWA C509.
      2) Minimum Pressure Rating: 250 psig .
      3) End Connections: Mechanical Joint.
      4) Interior Coating: Complying with AWWA C550.
   b. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for

depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel approximately 5 inches in diameter.

F. 2 inch Water Service Pipe (Temporary Disinfection & Blow-off):
1. Pipe: ASTM B88 Type K Copper Water tubing
2. Pipe Wall Thickness: Unless otherwise shown or specified, seamless copper tube shall be Type K, soft flare type. Installation of Type L or Type M tubing will not be permitted.
3. Temper: Seamless copper tubing installed underground shall have soft temper. Where exposed within structures, copper tubing shall be of hard temper.
4. Fittings: Unless otherwise shown, specified, or directed copper tubing installed underground shall have flared type brass joints and fittings with screwed unions.
5. Corporation Stops: Bronze construction, flared joint Ford Meter Box Company # FB 600 Ballcorp, or as manufactured by Mueller, Hayes, Red Hed or equal. Comply with AWWA C800.
6. Curb Stops (if required) Bronze construction, flared joint Ford Meter Box Company ball valve, Mueller "Oriseal", Red Hed, Hayes "Nuseal" or equal. Comply with AWWA C800.

G. Fire Hydrants –

Dry-Barrel Fire Hydrants:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Mueller Co.; Water Products Div.
    b. Kennedy Valve, a division of McWane, Inc.
    c. East Jordan Iron Works, Inc.
    d. American Foundary Group, Inc.

3. Description: Freestanding, with one NPS 4-1/2 and two NPS 2-1/2 outlets, 5-1/4-inch main valve, drain valve, and NPS 6 mechanical-joint inlet. Include interior coating according to AWWA C550. Hydrant shall have cast-iron body, compression-type valve opening against pressure and closing with pressure.

    a. Standard: AWWA C502.
    b. Pressure Rating: minimum 250 psig.

H. Polyethylene encasement for ductile iron water lines. – Encasement material shall be 8-mil thick polyethylene conforming to AWWA C105.

PART 3 - EXECUTION

3.1 INSPECTION. Pipe and fittings shall be carefully examined for cracks and other defects immediately before installation; spigot ends and bells shall be examined with particular care. All defective pipe and fittings shall be removed from the site of the work.

3.2 LAYING PIPE. Pipe shall be protected from lateral displacement by pipe embedment material installed as specified in the Trenching and Backfilling section. Pipe shall not be laid in water or other unsuitable conditions.

Pipe shall be laid with bell ends facing the direction of laying, except when reverse laying is specifically permitted by Owner's Representative.

Foreign matter shall be prevented from entering the pipe during installation.

Whenever pipe laying is stopped, the open end of the line shall be sealed with a watertight plug. All water shall be removed from the trench prior to removing the plug.

A. Cleaning. The interior of all pipe and fittings shall be thoroughly cleaned before installation and shall be kept clean until the work has been accepted.

B. Alignment. Piping shall be laid to the lines and grades indicated on the drawings. Pipelines or runs intended to be straight shall be laid straight. Deflections from a straight line or grade shall not exceed the maximum deflections specified by the manufacturer.

Unless otherwise specified or indicated on the drawings, and subject to acceptance by Owner's Representative, either shorter pipe sections or fittings shall be installed as required to maintain the indicated alignment or grade.

3.3 CUTTING PIPE. Cutting shall comply with the pipe manufacturer's recommendations and with Chapter 7 of AWWA Manual M23. Cuts shall be smooth, straight, and at right angles to the pipe axis. After cutting, the end of the pipe shall be dressed to remove all roughness and sharp corners and shall be beveled in accordance with the manufacturer's instructions.

3.4 JOINTS. Joints shall be stab-type unless otherwise indicated on the drawings. All buried pipe to be restrained.

A. Stab Type Joints. Jointing shall conform to the instructions and recommendations of the pipe manufacturer. All surfaces for gasketed joints shall be lubricated immediately before the joint is completed. Gaskets and lubricants shall be supplied by the pipe manufacturer, shall be suitable for use in potable water, shall be compatible with the pipe materials, shall be stored in closed containers, and shall be kept clean. Each spigot shall be suitably beveled to facilitate assembly.

B. Mechanical Joints. Mechanical joints shall be carefully assembled in accordance with the manufacturer's recommendations. If effective sealing is not obtained, the joint shall

be disassembled, thoroughly cleaned, and reassembled. Over-tightening of bolts to compensate for poor installation practice will not be permitted.

3.5 CONNECTIONS WITH EXISTING PIPING. Connections with existing pipes shall be made using fittings suitable for the conditions encountered. Each connection with an existing pipe shall be made at a time and under conditions which will least interfere with service to customers, and as authorized by Owner. Facilities shall be provided for proper dewatering and for disposal of water removed from the dewatered lines and excavations without damage to adjacent property.

Special care shall be taken to prevent contamination of potable water lines when dewatering, cutting into, and making connections with existing pipe. No trench water, mud, or other contaminating substances shall be permitted to enter the lines. The interior of all pipe, fittings, and valves installed in such connections shall be thoroughly cleaned and then swabbed with, or dipped in, a 200 mg/L chlorine solution.

3.6 SERVICE CONNECTIONS. Tapping saddles or tapping sleeves shall be used for all service connections 2 inches and smaller. Direct tapping of PVC pipe will not be permitted. Fittings shall be used for service connections larger than 2 inches.

3.7 CONCRETE ENCASEMENT. Concrete encasement shall be installed as indicated on the drawings. Concrete and reinforcing steel shall be as specified in the Cast-in-Place Concrete section. All pipe to be encased shall be suitably supported and blocked in proper position and shall be anchored against flotation.

3.8 POLYETHYLENE ENCASEMENT. Polyethylene encasement for ductile iron water lines. – Encasement material shall be 8-mil thick polyethylene conforming to AWWA C105.

3.9 RESTRAINED JOINTS. All bell-and-spigot or all-bell tees, Y-branches, bends deflecting 11-1/4 degrees or more, valves, and plugs which are installed in piping subjected to internal hydrostatic heads in excess of 30 feet shall be provided with suitable restraint.

Concrete blocking shall extend from the fitting to solid, undisturbed earth and shall be installed so that all joints are accessible for repair. The dimensions of concrete reaction blocking shall be as indicated on the drawings or as directed by Engineer.

Reaction blocking, anchorages, or other supports for fittings installed in fills or other unstable ground shall be provided as indicated by the drawings or as directed by Engineer.

All steel clamps, rods, bolts, and other metal accessories used in tapping saddles or reaction anchorages subject to submergence or in contact with earth or other fill material, and not encased in concrete, shall be coated in accordance with the Protective Coatings section.

All steel clamps, rods, bolts, and other metal accessories used in tapping saddles or reaction anchorages subject to submergence or in contact with earth or other fill material, and not encased in concrete, shall be protected from corrosion by two coats of medium consistency coal tar applied to clean, dry metal surfaces. he first coat shall be dry and hard before the second coat is applied.

3.09 PRESSURE AND LEAKAGE TESTS. After installation, DI piping shall be hydrostatically

tested for defective workmanship and materials as specified in the Pipeline Pressure and Leakage Testing – Part 3.16 of this Specification Section. Testing of piping system shall be completed prior to final cleaning and disinfection.

3.10 LEAKAGE. All DI piping shall be watertight and free from leaks. Each leak which is discovered within the correction period stipulated in the General Conditions shall be repaired by and at the expense of Contractor.

3.11 CLEANING and DISINFECTION – Refer to Section 331300.

3.12 Installation of 2 inch water service line (Disinfection Tap):

1.) The maximum size threaded taps permitted are listed as follows:

	PIPE SIZE (inches)						
	4	**6**	**8**	**12**	**16**	**20**	**24 and larger**
Ductile Iron Pipe With Service Clamp Without Service Clamp	2 1	2 1 ½	2 1¾	2 2	2 2	2 2	2 2
Polyvinyl Chloride Pipe With Service Clamp Only	-	2	2	2	2	2	2

Notes Regarding Service Taps:

- Tapped connections shall be installed only by or under the direction of personnel who have performed similar operations for at least five years.
- Curb stops shall be located where directed by the Owner's Representative and shall be properly jointed and supported.
- Threaded taps shall be performed using machines which are satisfactory for cutting, threading, and inserting a corporation cock in the pipe while the pipe is under pressure and without disrupting service.

2.) Active Services: Contractor to install corporation stop, copper pipe, and connect to existing service pipe using an approved coupling. If disturbed, curb boxes shall be re-set plumb and adjusted to the proper elevation. Boxes shall be independently supported by two bricks (or a 4"x8"x16" concrete block) and shall not ride on the curb stop. If the trench has settled, service boxes shall be readjusted to the final grade.

3.) Piping System for 2" Copper: Install pipe using one continuous length with no intermediate fittings between the point of connection to the existing service pipe. Handle and install all materials in accordance with the recognized manufacturer or industry

standards; use proper tools and employ high quality workmanship. Install warning tape in the trench, as per Section 330526.

4. Cleaning and Disinfection of Copper Water Service Line:
- Prevent contamination of the service line and water supply.
- Prior to connecting the new service line, thoroughly flush the service line with potable water until the water runs clear for at least one minute. Dispose of flushed water without damaging property.
- Disinfect the service line in accordance with Section 331300.

5. Backfill and Restoration of Copper Water Service Line:
- Pressure test the service lines as outlined in Part 3.16.
- Bed with sand, and backfill and compact as shown on the drawings, and the relevant specification sections.
- Return all surfaces and other disturbed structures to a condition equal to or better than the condition at the start of construction. Refer to Section 310100 (Maintenance of Earthwork).

3.12 ANCHORAGE INSTALLATION

A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:

1. Concrete thrust blocks.
2. Locking mechanical joints.

B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:

i. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.

C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.13 VALVE INSTALLATION

A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.

B. AWWA Valves Other Than Gate Valves: Comply with AWWA C600 and AWWA M44.

C. UL/FMG, Valves Other Than Gate Valves: Comply with NFPA 24.

D. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.

3.14 TRENCH INSTALLATION – Refer to Section 312000 “Earth Moving”.

3.15 UTILITY IDENTIFICATION – Refer to Section 330526 “Utility Identification”.

3.16 PIPELINE PRESSURE AND LEAKAGE TESTING

A. Contractor shall notify local regulatory agencies to determine if any special procedures or permits are required for disposal of water used for pressure and leakage testing and to identify acceptable locations for disposal of the water. All requirements and costs associated with notifications and obtaining any discharge permit or approvals shall be responsibility of Contractor.

Owner’s Representative shall be present during testing and shall be notified of the time and place of testing at least 3 days prior to commencement of the work. All work shall be performed to the satisfaction of Owner’s Representative. Refer to Exhibit A at the end of this Section (Contractor’s Material and Test Certificate for Underground Piping).

B. Testing Schedule and Procedure. A testing schedule and test procedure shall be submitted to the Owner’s Representative for review and acceptance not less than 21 days prior to commencement of testing. The schedule shall indicate the proposed time and sequence of testing of the piping. The testing procedure shall establish the limits of the piping to be tested, the positions of all valves during testing, the locations of temporary bulkheads, and all procedures to be followed in performing the testing.

C. Special Testing Requirements. Special testing requirements include the following:

- Initial flushing and cleaning of pipeline.
- Filling pipeline.
- Hydrostatic pressure and leakage testing.
- Disinfection.
- Final cleaning, flushing, and neutralization of heavily chlorinated water.
- Bacteriological tests.

Unless otherwise acceptable, temporary bulkheads shall be provided during testing so that the test pressures are not applied to existing or new valves and hydrants, or to existing water lines, or to any portion of water lines installed under this Contract that have already been put into service.

A temporary pressure gauge shall be installed at each end of the limits of the pipeline to be tested.

The tests shall be conducted before connections are made to existing water lines, or to any portion of water lines installed under this Contract that have already been put into service.

All auxiliary hydrant valves shall be closed during pressure testing so that the test pressure is not applied to the hydrant valves.

Unless otherwise acceptable, upon completion of testing and disinfection, connections made to existing water lines or to any portion that has been put into service of new water lines installed under this Contract, shall be visually inspected for leakage after placing

the water line into service and before backfilling the connection.

D. Water. Water for testing shall be furnished from on-site facilities, Contractor to Coordinate with Owner. The water shall be kept out of the remainder of the piping.

E. Test Equipment. All necessary connections between the piping to be tested and the water source, together with pumping equipment, water meter, pressure gauges, and all other equipment, materials, and facilities required to perform the specified tests, shall be provided by the Contractor. All required flanges, valves, bulkheads, bracing, blocking, and other sectionalizing devices shall also be provided. All temporary sectionalizing devices shall be removed upon completion of testing. Vents shall be provided in test bulkheads where necessary to expel air from the piping to be tested.

Test pressures shall be applied by means of a force pump sized to produce and maintain the required pressure without interruption during the test.

Water meters and pressure gauges shall be accurately calibrated and shall be subject to review and acceptance by Owner's Representative.

Permanent gauge connections shall be installed at each location where test gauges are connected to the piping during the required tests. Drilling and tapping of pipe walls will be permitted. Upon completion of testing, each gauge connection shall be fitted with a removable plug or cap acceptable to Owner's Representative.

F. Testing Procedure:

1.0 FILLING AND VENTING. Before filling the piping with water, care shall be taken to ensure that all air release valves and other venting devices are properly installed and in the open position. Hand-operated vent valves shall not be closed until an uninterrupted stream of water is flowing from each valve. The rate of filling the piping with water must not exceed the venting capacity of the installed air vent valves and devices.

2.0 BLOCKING AND BACKFILLING. Piping shall be adequately blocked, anchored, and supported before the test pressure is applied.

3.0 PRESSURE TESTING. After the piping to be tested has been filled with water, the test pressure shall be applied and maintained without interruption within plus or minus 5 psi of test pressure for 2 hours plus any additional time required for the Owner's Representative to examine all piping being tested and for Contractor to locate any defective joints and pipe materials.

a. Pipeline Test Pressure. The hydrostatic pressure maintained during the pressure test shall be 150 psig.

   In areas where there fire service to a building is directly connected to an interior sprinkler system, this adjacent section of line is to be tested to 200 psig, or 50 psi in excess of the working pressure, whichever is greater, but no less than 150 psig.

4.0 PIPING LEAKAGE. All piping shall be watertight and free from leaks. Each leak that is discovered within the correction period stipulated in the General Conditions

shall be repaired by and at the expense of Contractor.

5.0 PIPELINE LEAKAGE TESTING. Following completion of pressure testing and acceptance by Consultant, the pipeline piping shall be subjected to a leakage test. The duration of the leakage test shall be 2 hours plus the additional time required for the Owner's Representative to make an accurate determination of leakage.

a. Leakage Test Pressure. The hydrostatic pressure maintained during the leakage test shall be at least 75 percent, but not more than 100 percent, of the pressure specified for pressure testing of the piping and shall be maintained within plus or minus 5 psi during the entire time that leakage measurements are being performed.

b. Leakage Measurement. Measurement of leakage shall not be attempted until all trapped air has been vented and a constant test pressure has been established. After the pressure has stabilized, piping leakage shall be measured with a suitable water meter installed in the pressure piping on the discharge side of the force pump.

c. Allowable Leakage. The term "leakage", as used herein, refers to the total amount of water that must be introduced into the piping during the leakage test to maintain the test pressure.

No piping will be accepted if and while it exhibits a leakage rate in excess of that determined by the indicated formulas:

Q = 0.0075 DLN (using inch-pound units)

Where

Q = allowable leakage in gallons per hour

D = nominal diameter of pipe in inches

L = length of section tested in thousand feet

N = square root of average test pressure in pounds per square inch

Whenever the piping to be tested contains pipe of different diameters, the allowable leakage shall be calculated separately for each diameter and the corresponding length of piping. The resulting allowable leakage rates shall be added to obtain the total allowable leakage for the entire piping.

All joints in piping shall be watertight and free from visible leaks during the leakage test. Each leak that is discovered within the correction period shall be repaired by and at the expense of Contractor regardless of the amount that the total leakage may have been below the specified allowable leakage rate during the leakage test.

If the leakage test indicates a higher than allowable leakage rate, Contractor shall locate and repair leaking joints and other defective work to the extent necessary to reduce the leakage to an acceptable value.

EXHIBIT A

CONTRACTOR'S MATERIAL AND TEST CERTIFICATE FOR UNDERGROUND PIPING

Contractor's Material and Test Certificate for Underground Piping

PROCEDURE
Upon completion of work, inspection and tests shall be made by the contractor's representative and witnessed by an owner's representative. All defects shall be corrected and system left in service before contractor's personnel finally leave the job.

A certificate shall be filled out and signed by both representatives. Copies shall be prepared for approving authorities, owners, contractor, and the State Fire Marshal. It is understood the owner's representative's signature in no way prejudices any claim against contractor for faulty material, poor workmanship, or failure to comply with approving authority's requirements or local ordinances.

Property Name			
Property Address	City	State	Zip

PLANS	Accepted by approving authorities (names)		
	Address		
	Installation conforms to accepted plans	❑ Yes	❑ No
	Equipment used is approved	❑ Yes	❑ No
	If no, state deviations		
INSTRUCTIONS	Has person in charge of fire equipment been instructed as to location of control valves and care and maintenance of this new equipment? If no, explain	❑ Yes	❑ No
	Have copies of appropriate instructions and care and maintenace charts been left on premises? If no, explain	❑ Yes	❑ No
LOCATION	Supplies buildings		
UNDERGROUND PIPES AND JOINTS	Pipe types and class / Type joints		
	Pipe conforms to _____ Standard	❑ Yes	❑ No
	Fittings conform to _____ Standard	❑ Yes	❑ No
	Joints needed anchorage clamped, strapped or blocked in accordance with _____standard	❑ Yes	❑ No
TEST DESCRIPTION	**FLUSHING:** Flow the required rate until water is clear as indicated by no collection of foreign material in burlap bags at outlets such as hydrants and blow-offs. Flush at flows not less than 390 GPM (1476 L/min) for 4-inch pipe, 880 GPM (3331 L/min) for 6-inch pipe, 1560 GPM (5905 L/min) for 8-inch pipe, 2440 GPM (9235 L/min) for 10-inch pipe, and 3520 GPM (13323 L/min) for 12-inch pipe. When supply cannot produce stipulated flow rates, obtain maximum available.		
	HYDROSTATIC: Hydrostatic tests shall be made at not less than 200 psi (13.8 bars) for two hours or 50 psi (3.4 bars) above static pressure In excess of 150 psi (10.3 bars) for two hours.		
	LEAKAGE: New pipe laid with rubber gasketed joints shall, if the workmanship is satisfactory, have little or no leakage at the joints. The amount of leakage at the joints shall not exceed 2 quarts per hour (1.89 L/hr) per 100 joints irrespective of pipe diameter. The leakage shall be distributed over all joints. If such leakage occurs at a few joints, the installation shall be considered unsatisfactory and necessary repairs made. The amount of allowable leakage specified above can be increased by 1 fl oz per inch valve diameter per hour (30 mL/25 mm/hr) for each metal seated valve isolating the test section. If dry barrel hydrants are tested with the main valve open so the hydrants are under pressure, an additional 5 oz per minute (150 mL/min) leakage is permitted for hydrant.		
FLUSHING TESTS	New underground piping flushed according to_____standard by (company) If no, explain	❑ Yes	❑ No
	How flushing flow was obtained: ❑ Public water ❑ Tank or reservoir ❑ Fire pump	Through what type of opening: ❑ Hydrant butt ❑ Open pipe	
	Lead-ins flushed according to _____standard by (company) If no, explain	❑ Yes	❑ No
	How flushing flow was obtained: ❑ Public water ❑ Tank or reservoir ❑ Fire pump	Through what type of opening: ❑ Y connection to flange spigot ❑ Open pipe	

HYDROSTATIC TEST	All new underground piping hydrostatically tested at _____ psi for _____ hours		Joints covered ❑ Yes ❑ No
LEAKAGE TEST	Total amount of leakage measured _____ gallons _____ hours		
	Allowable leakage _____ gallons _____ hours		
HYDRANTS	Number installed	Type and make	All operate satisfactorily ❑ Yes ❑ No
CONTROL VALVES	Water control valves left wide open ❑ Yes ❑ No If no, state reason		
	Hose threads of fire department connections and hydrants interchangeable with those of the fire department answering alarm ❑ Yes ❑ No		
REMARKS	Date left in service _____		
Signature	Name of installing contractor		
	Contractor's Address	City / State / Zip	
	Tests witnessed by		
	For property owner (signed)	Title	Date
	For Installing contractor (signed)	Title	Date

Additional Explanation and Notes:

END OF SECTION

SECTION 33 12 16
WATER UTILITY DISTRIBUTION VALVES

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. Requirements for ductile iron water valves.

1.2 REFERENCED SECTIONS:

A.	Section 31 23 00	Excavation and Fill
B.	Section 02 61 13	Excavation, Removal and Handling of Contaminated Material
C.	Section 33 11 13	Public Water Utility Distribution Piping
D.	Section 33 12 19	Water Utility Distribution Fire Hydrants
E.	Section 33.13 00	Disinfection of Water Utility Disinfection

1.3 CITED STANDARDS:

A. All materials and installation of exterior water supply systems shall comply with the latest requirements of the NYSDEC Bureau of Water Supply Standards, Details and Specifications.

B. NYS Department of Health Manual for Cross Connection Control.

C. American Water Works Association (AWWA):

1.	C110	Ductile Iron Fittings
2.	C111	Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings
3.	C151	Ductile Iron Pipe
4.	C203	Pipe Protection Systems
5.	C500	Gate Valves
6.	C600	Inspection, Storage and Handling
7.	C651	Disinfecting Water Mains
8.	C800	Underground Service Line Valves and Fittings

1.4 NOTED RESTRICTIONS:

A. Comply with all requirements of the New York State Department of Health and NYSDEC for the disinfection of potable water lines, valves, hydrants, storage tanks, and

appurtenances.

1.5 QUALITY CONTROL:

A. (None listed)

1.6 SUBMITTALS:

A. Shop drawings, catalog cuts, material certifications, and manufacturers' installation instructions, indicating materials, details, layouts and construction information.

B. Proposed procedure for locating existing waterlines.

C. Proposed points and method of connection to existing water lines.

D. Field test reports.

E. Copies of required permits.

F. Quality Control Submittals: Statement of compliance with ANSI/AWWA Specifications and NYSDEC, Bureau of Water Supply Specifications.

G. As-Built drawings in accordance with NYSDEC criteria.

1.7 DELIVERABLES:

A. (None listed)

PART 2 PRODUCTS

2.1 GENERAL:

A. Materials shall be in conformance with applicable requirements of the NYSDEC, the ASTM Standard Specifications, and the AWWA Standard Specifications referenced herein. Manufacturers shall certify that the products supplied are approved for use by the NYSDEC New York Water Supply (NYWS).

B. Fire hydrant systems must be in conformance with the applicable requirements of the 2020 FCNYS (507.5).

C. All materials shall be new and unused.

2.2 CRITERIA:

A. Valves:

1. Gate:

a. Valves shall comply with the NYSDEC Standard Specification for 2" – 24" Standard Valves with Various End Connection. See NYSDEC Standard Details for valves and valve boxes.

b. The Department of Environmental Protection specification for the standard valves exceeds the AWWA Standard for Gate Valves for Water and Sewerage Systems, ANSI/AWWA C500-93 in certain areas. They have thicker bodies and bonnets, large diameter stems, and a double disc seating wedging mechanism. Therefore, in those areas of these specifications and related drawings where the specific quality, dimensions or characteristic of a valve component or principal requirements of construction differs from the AWWA standard, the NYSDEC specifications shall govern.

c. The standard valves shall be manually operated, inside non-rising stem, ductile iron body/bonnet/seal plate, non-packing, bronze seated, double disc, seating wedging mechanism type, built in accordance with the NYSDEC drawings.

2. Check: Iron body, swing check, threaded ends.

PART 3 EXECUTION

3.1 PREPARATION:

A. Transmit submittals required by this Section.

B. Furnish products as indicated.

C. Ensure that substrates are in suitable condition to receive the work.

D. Comply with the provisions specified in Section 1.02.B, "Inspection, Storage and Handling" of AWWA Standard C600.

E. Install water main and appurtenances in conformance with the latest NYSDEC details and specifications.

3.2 GENERAL:

A. Maintain profiles of all utilities where shown. If not shown, maintain minimum 4’ cover. Coordinate with all other utilities to eliminate interference.

B. Safeguard and support existing water mains and appurtenances to remain in place.

C. Water line locations shall clear obstructions and maintain a minimum cover of 4 feet over the water line pipes or a minimum of 5 feet over casing pipe of water line under tracks, whichever is deeper.

D. Submit a method of locating existing water lines and proposed point of connection.

3.3 INSTALLATION:

A. Install pipe, fittings and valves in accordance with the AWWA C600 and NYSDEC Standard Water Main Details and Specifications.

B. Valves and Hydrants: Install in accordance with approved installation shop drawings and in accordance with the manufacturer's recommendations. Valves shall be set as per NYSDEC Standard Water Main Specifications and NYSDEC details.

END OF SECTION

SECTION 33 12 19
WATER UTILITY DISTRIBUTION FIRE HYDRANTS

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. Requirements for fire hydrants.

1.2 REFERENCED SECTIONS:

A. Section 31 23 00 Excavation and Fill

B. Section 02 61 13 Excavation, Removal and Handling of Contaminated Materials

C. Section 33 11 13 Public Water Utility Distribution Piping

D. Section 33 12 16 Water Utility Distribution Valves

E. Section 33 13 00 Disinfection of Water Utility Disinfection

1.3 CITED STANDARDS:

A. All materials and installation of exterior water supply systems shall comply with the latest requirements of the New York State Department of Environmental Conservation, Bureau of Water Supply Standards, Details and Specifications.

B. NYS Department of Health Manual for Cross Connection Control.

C. Municipal Water Authority

D. American Water Works Association (AWWA):

1. C110 Ductile Iron Fittings

2. C111 Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings

3. C151 Ductile Iron Pipe

4. C203 Pipe Protection Systems

5. C500 Gate Valves

6. C600 Inspection, Storage and Handling

7. C651 Disinfecting Water Mains

8. C800 Underground Service Line Valves and Fittings

1.4 NOTED RESTRICTIONS:

A. Comply with all requirements of the New York State Department of Health and NYSDEC for the disinfection of potable water lines, valves, hydrants, storage tanks, and appurtenances.

1.5 QUALITY CONTROL:

A. Fire Hydrants; flushing and operational testing, shall be in accordance with NFPA 24 & 25.

1.6 SUBMITTALS:

A. Shop drawings, catalog cuts, material certifications, and manufacturers' installation instructions, indicating materials, details, layouts and construction information.

B. Proposed procedure for locating existing waterlines.

C. Proposed points and method of connection to existing water lines.

D. Field test reports.

E. Copies of required permits.

F. Quality Control Submittals: Statement of compliance with ANSI/AWWA Specifications and New York State Department of Environmental Conservation, Bureau of Water Supply Specifications.

G. As-Built drawings in accordance with NYSDEC criteria.

1.7 DELIVERABLES:

A. (None listed)

PART 2 PRODUCTS

2.1 GENERAL:

A. Materials shall be in conformance with applicable requirements of the New York State Department of Environmental Conservation, the ASTM Standard Specifications, and the AWWA Standard Specifications referenced herein. Manufacturers shall certify that the products supplied are approved for use by the NYSDEC New York Water Supply (NYWS).

B. All materials shall be new and unused.

2.2 CRITERIA:

A. Fire Hydrants: Manufactured by U.S. Pipe or approved equal. Manufacturer shall certify that the hydrant is approved for use in New York State by the Town Of Goshen Building and Zoning and Fire Department and Water Authority.

B. The Goshen Fire Department is requesting the following connections on all new construction and renovations. All hydrants are to have a 5 inch stroz steamer connection. Also the hydrant should have a total of 2 nst connections which are 2 '/ inch .The sprinkler connection has a 5 inch storz connection.

C. The stand pipe connection will be a Siamese with 2 /2 inch nst connections. If you have any questions feel free to contact the Town of Goshen Fire Department

PART 3 EXECUTION

3.1 PREPARATION:

A. Transmit submittals required by this Section.

B. Furnish products as indicated.

C. Ensure that substrates are in suitable condition to receive the work.

D. Comply with the provisions specified in Section 1.02.B, "Inspection, Storage and Handling" of AWWA Standard C600.

E. Install water main and appurtenances in conformance with the latest NYSDEC details and specifications.

3.2 EXCAVATION:

A. Prior to setting yard hydrants, install pea gravel or gravel from 12 inches below the base of the valve stem up to the bottom of the yard hydrant box, within the area of excavation required to accommodate the installation.

3.3 INSTALLATION:

A. Fire Hydrants:

1. Set fire hydrants plumb with steamer and nozzle centerline elevations 19 inches above finished grade, or match grade-line indicated on barrel of hydrants with finished grade. Provide thrust blocks as indicated. Backfill with 4 cubic feet of crushed stone around the waste or drip outlet with ½ of the stone below the outlet. Arrange remaining balance of stone around hydrant to prevent damage to the connections from mechanical shock and to insure hydrant stability.

2. Clean and paint all parts of the hydrants showing above the ground with two finish coats of paint.

3. Hydrants shall be set as per NYSDEC Standard Water Main Specifications and NYSDEC details.

4. Install bollards as per NYSDEC Standard Steel Hydrant Detail.

END OF SECTION

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SECTION 33 13 00 - DISINFECTION OF WATER UTILITY DISTRIBUTION

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. Requirements for disinfection and testing of ductile iron water piping, valves, fittings, fire hydrants, reduced pressure zone backflow preventers, meters and appurtenances.

1.2 REFERENCED SECTIONS:

A. Section 33 11 13 Public Water Utility Distribution Piping

B. Section 33 12 16 Water Utility Distribution Valves

C. Section 33 12 19 Water Utility Distribution Fire Hydrants

1.3 CITED STANDARDS:

A. All materials and installation of exterior water supply systems shall comply with the latest requirements of the New York City Department of Environmental Protection Bureau of Water Supply Standards, Details and Specifications.

B. NYS Department of Health Manual for Cross Connection Control.

C. American Water Works Association (AWWA):

1. C110 Ductile Iron Fittings
2. C111 Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings
3. C151 Ductile Iron Pipe
4. C203 Pipe Protection Systems
5. C500 Gate Valves
6. C600 Inspection, Storage and Handling
7. C651 Disinfecting Water Mains
8. C800 Underground Service Line Valves and Fittings

1.4 NOTED RESTRICTIONS:

A. Comply with all requirements of the New York State Department of Health and NYCDEP for the disinfection of potable water lines, valves, hydrants, storage tanks, and appurtenances.

1.5 QUALITY CONTROL:

A. (None listed)

1.6 SUBMITTALS:

A. Field test reports.

B. Copies of required permits.

C. Quality Control Submittals: Statement of compliance with ANSI/AWWA Specifications and New York City Department on Environmental Protection, Bureau of Water Supply Specifications.

D. As-Built drawings in accordance with NYCDEP criteria.

1.7 DELIVERABLES:

A. (None listed)

PART 2 PRODUCTS

2.1 GENERAL:

A. Materials shall be in conformance with applicable requirements of the NYC Department of Environmental Protection, the ASTM Standard Specifications, and the AWWA Standard Specifications referenced herein. Manufacturers shall certify that the products supplied are approved for use by the NYCDEP New York Water Supply (NYWS).

B. All materials shall be new and unused.

PART 3 EXECUTION

3.1 TESTING:

A. Test the water distribution systems prior to placing any pavement and again before final acceptance after completion of all paving and concrete slab installation.

B. Test the water distribution systems in accordance with NYCDEP Standard Water Main Specifications using a water pressure equal to the line pressure or 60 psi, whichever is

greater. Repair all leaks discovered under the test.

C. Furnish all apparatus, material and labor necessary for the tests.

D. Tests for the RPZ backflow preventer shall be in accordance with the NYS Department of Health Manual for Cross Connection Control.

3.2 CLEANING AND DISINFECTING PIPE:

A. Disinfect potable water lines to eliminate all evidence of bacteria indicative of human or animal contamination by testing of samples taken from the water main. Provide all required accessories to facilitate disinfecting the system.

B. Clean and disinfect the system as per NYCDEP Standard Water Main Specifications.

END OF SECTION

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SECTION 33 31 13
PUBLIC SANITARY UTILITY SEWERAGE PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. Requirements for sanitary sewerage system, including piping.

B. Definition of terms shall be in accordance with ASTM C 822.

1.2 REFERENCED SECTIONS:

A. Section 33 39 13 Sanitary Utility Sewerage Manholes, Frames and Covers

1.3 CITED STANDARDS:

A. American Society for Testing and Materials (ASTM):

1. D 1784 PVC Standards

2. D 1785 PVC Pipe

3. D 2321 Practice for the Underground Installation of Pipe for Sewers

4. D 3034 Specification for type PSM, PVC Sewer Pipe and Fittings

5. D 3212 Specification for Joints for Drain and Sewer Plastic Pipes using Flexible Elastomeric Seals

6. F 477 Specification for Elastomeric Seals (Gaskets) for Joining Pipe

1.4 NOTED RESTRICTIONS:

A. (None noted)

1.5 QUALITY CONTROL:

A. Comply with cleaning requirements and line and grade survey requirements identified in Section 33 39 13 3.03.

1.6 SUBMITTALS:

Submit the following:

A. Product data for the following materials:

1. Pipe and pipe fittings.

2. Joints, solvent cements.

3. Cleanouts.

4. Results of Testing for approval by Engineer

B. Field Test Reports.

C. Copies of required permits.

1.7 DELIVERABLES:

A. (None listed)

PART 2 PRODUCTS

2.1 MATERIALS:

A. Gravity Sewer Pipe: PVC SDR 26 conforming to ASTM D3034. Pipe shall be made from quality resin, compounded to provide physical and mechanical properties that equal or exceed cell class 12454 as defined in ASTM D1784. Gaskets shall meet the requirements of ASTM F477.

B. The joint between polypropylene plastic pipe and fittings shall incorporate an elastomeric seal. The joint shall conform to ASTM D-3212. Mechanical joints shall not be installed above ground.

C. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns.

D. PVC Pressure Fittings: ASTM D 2466, Socket Type.

E. Concrete: Cast-in-Place concrete and precast concrete: 4,000 PSI conforming to the requirements of Section 03 30 00. Reinforcing Steel shall conform to the requirements of Section 03 20 00.

F. Casting for cleanouts: Catalog No. R-7506, Neenah Foundry Company, Neenah Wisconsin, or Engineer Approved Equal. Lid cast with the designation “Clean Out”. Diameter of frame shall be adequate to fit over outer diameter size of sewer pipe.

PART 3 EXECUTION

3.1 PREPARATION:

A. Transmit submittals required by this Section.

B. Furnish products as indicated.

C. Ensure substrates are in suitable condition to receive the work.

3.2 EXCAVATE AND TRENCH:

Excavate and trench in accordance with Section 31 23 00 - Excavation and Fill and 02 61 13 Excavation, Removal and Handling of Contaminated Material.

A. Excavate to the lines and grades required to accommodate the installation.

B. Provide sheeting and shoring as required by OSHA.

3.3 INSTALL PIPES:

A. Install joints and couplings in accordance with the manufacturer's recommendations and procedures. Pipe and fittings shall be installed in accordance with ASTM D2321.

B. Piping under roadways shall be cable of withstanding HS20 loading.

3.4 BACKFILL EXCAVATIONS:

A. Provide bedding under pipes in accordance with the contract documents and Specification Section 31 23 00 - Excavation and Fill.

B. Backfill in layers not more than 6” thick and compact to 95% of maximum density at optimum moisture content (ASTM D 1556).

C. Backfill excavations in accordance with Section 31 23 00 - Excavation and Fill.

3.5 INSTALL CLEANOUTS:

A. Provide 24-inch square concrete collar, 8-inch thick around cleanout casting.

B. Set casting and concrete collar flush with adjacent finish grade.

3.6 TESTING:

A. Leakage Test:

1. Test sanitary sewer systems after backfilling has been completed and prior to placing any pavement and again before final acceptance.

2. Allowable Leakage:

a. Leakage or infiltration for gravity sewer pipelines, encased or not encased, shall not exceed 100 gallons per inch diameter, per mile of sewer per day.

b. No individual joint in any completed sewer under test shall leak an amount in excess of 1/8 gallon per hour per inch of inner diameter.

3. Gravity Sewers:

a. Test method: Internal pressure.

b. The section of the sewer to be tested shall be plugged or bulkheaded and the manhole or riser filled with water until the internal pressure in the sewer pipe is equivalent to a pressure head of not less than 4 feet above the exterior crown of the sewer section at the upstream end or not less than 4 feet above groundwater level at its highest point, whichever is higher. Such head shall be maintained for a minimum of 8 hours.

END OF SECTION

SECTION 33 39 13
SANITARY UTILITY SEWERAGE MANHOLES, FRAMES AND COVERS

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. This section includes the fabricating, furnishing, installing and constructing drainage structures in conformance with NYSDOT Standard Sheets and Specifications. The Contractor shall provide all labor, materials and equipment necessary to construct manholes in the locations shown on the plans.

1.2 REFERENCED SECTIONS:

A.	Section 33 01 30.13	Sewer and Manhole Testing
B.	Section 33 31 13	Public Sanitary Utility Sewerage Piping

1.3 CITED STANDARDS:

A. NYSDOT Standard Specification Section 604 for manholes.

B. NYSDOT Standard Specification Section 655 for frames, grates and covers.

C. NYSDOT Standards Sheets, including the latest revisions of 604-01, 604-02, 655-03, 655-04 and 655-05.

1.4 NOTED RESTRICTIONS:

A. Manholes shall be rectangular or a precast round alternate.

B. Provide protection during installation in accordance with Title 29 Code of Federal Regulations, Part 1926, Safety and Health Regulations for Construction (OSHA).

1.5 QUALITY CONTROL:

A. (None listed)

1.6 SUBMITTALS:

A. The Contractor shall submit shop drawings for manholes, frames, and covers. The shop drawings shall show dimensions, reinforcement, typical pipe openings, frame attachment details, slab details, and other pertinent information. The manufacturer shall certify that the design complies with NYSDOT requirements. The shop drawings shall cover all structure sizes that will be used on the project.

B. The Contractor shall submit Drill Sheets for each drainage structure based on the approved shop drawings. The Drill Sheets shall show elevations for top of frame, top of slab, bottom of slab and all inverts. The Drill Sheets shall show structure dimensions, joints, pipe nominal diameters and pipe wall opening sizes. Pipe opening sizes and locations shall comply with NYSDOT requirements and be clearly labeled on the Drill

Sheets. The size of the drainage structure shall be sized accordingly to accommodate the proposed pipes. Drainage structures that are too small for the proposed pipes will not be approved.

1.7 DELIVERABLES:

A. (None listed)

PART 2 PRODUCTS

2.1 MANHOLES, FRAMES, AND COVERS

A. Materials and products shall comply with NYSDOT Standard Specification Material Requirements, including:

1.	Cast-in-Place Concrete - Class A	501
2.	Drainage Structures	604
3.	Frames and Grates	655
4.	Concrete Repair Material	701-04
5.	Concrete Grouting Material	701-05
6.	Precast Concrete Driveway and Sidewalk Pavers	704-13
7.	Premolded Resilient Joint Filler	705-07
8.	Masonry Mortar	705-21
9.	Reinforced Concrete Pipe	706-02
10.	Precast Concrete Drainage Units	706-04
11.	Bar Reinforcement, Grade 60	709-01
12.	Wire Fabric for Concrete Reinforcement	709-02
13.	Cold Drawn Wire for Concrete Reinforcement	709-09
14.	Steps for Manholes	725-02

B. All frames and covers shall accommodate HS20 loading.

C. Bedding material shall be installed under all drainage structures and consist of a minimum of 8” of compacted crushed stone NYSDOT No. 2.

D. Submit anti-floatation calculations for structures that will be subjected to groundwater.

PART 3 EXECUTION

3.1 PREPARATION

A. Transmit submittals required by this section.

B. Furnish products as indicated.

C. Store products on site so that they are not damaged. Replace or repair any damaged structures to the satisfaction of the Engineer.

3.2 INSTALLATION

A. Excavation. Excavation shall be in conformance with the Construction Details of NYSDOT Standard Specification Section 206-3, Trench, Culvert and Structure Excavation.

B. Concrete Drainage Structures and Manholes.

1. Manholes shall be constructed in accordance with the requirements of these specifications, the NYSDOT Standard Sheets and plans. The Contractor shall have the option of erecting either cast-in-place or precast drainage structures unless specified otherwise. Cast-in-place drainage structures shall be constructed of Class A concrete and to the requirements of NYSDOT Standard Specification Section 555 Structural Concrete.

2. The Contractor shall have the option of constructing either a rectangular or circular drainage structure when such option is specified and allowed in the contract documents; option shall comply with the above Section 1.04 of this specification section. When the circular structure is selected, it shall conform to the requirements of NYSDOT Standard Specification Section 706-04 and will require submission of complete working drawings to the Engineer for review and approval. Contractor proposed changes to drainage structures shown on the Standard Sheets or on the plans, other than minor changes approved by the Engineer, shall require submission of complete working drawings to the Engineer for review and approval.

C. Unless prohibited in the contract documents, the Contractor shall have the option of reducing the size of the drainage structure riser above the uppermost pipe entry in accordance with the requirements of the NYSDOT Standard Sheets. Flat slab reducer designs proposed by the Contractor shall be subject to the review and approval of the Engineer and shall be accompanied by the following:

a. Working drawings prepared by a Professional Engineer licensed to practice in New York State.

b. The design calculations used in the preparation of the working drawings.

c. Acceptance of flat slab tops or platforms for flat slab reducer designs will be on the Basis of Proof-of-Design Test or on the Basis of Rational Design as required by ASTM C478.

D. Masonry Construction. Masonry construction, when indicated on the plans or NYSDOT

Standard Sheets, shall consist of concrete pavers laid in full mortar beds. All joints shall be full mortar joints not greater than 1/2 inch wide. When specified, the outside of the masonry construction shall be plastered with 1/2 inch thick mortar coat.

E. Pipe Entries. All pipe(s) built into the wall(s) of a drainage structure shall be flush with the inside face of the drainage structure wall and shall project outside a sufficient distance to allow connection with the adjoining section. The wall knockouts and sealing the space around the pipe shall be in accordance with the NYSDOT Standard Sheets. The bell of concrete pipe shall be cut off at every pipe entry where the bell enters the drainage structure.

F. Steps. Drainage structures steps may be cast or bolted in place during construction, mortared with a concrete grouting material after the structure is completed or attached by friction locking into preformed or drilled holes. The steps shall clear all pipes. Steps in risers and conical top sections shall be aligned to form a continuous ladder with rungs equally spaced vertically in the completed structure at a maximum distance of 16 inches. Steps shall be embedded into the walls of the riser or conical top section a minimum of 3 inches. The rung shall project a minimum clear distance of 4 inches from the walls of the riser or conical sections measured from the point of embedment.

G. Frames and Grates. Frames located in the top slab or top of the uppermost riser shall be secured and held in place by a minimum of 4 stirrups or studs per frame, welded to the frame near the corners. Parallel bar frames shall contain shear stud anchors, for the purpose of transferring loads, as required and detailed on the NYSDOT Standard Sheet for parallel bar grates and frames. Shear stud anchors, when required, shall replace the frame securing stirrups or studs.

H. Altering Drainage Structures and Manholes. Reconstruction and adjustment of existing drainage structures shall be as detailed and specified on the contract plans. Construction with cast-in-place concrete shall conform to the requirements of NYSDOT Standard Specification Section 555, Structural Concrete. Frames, grates and covers to be reused shall be removed, cleaned and reset at the required elevations. New frames, grates and manhole covers shall be installed when specified. Upon completion, each structure shall be cleaned of any accumulation of silt, debris or foreign matter of any kind and shall be kept clear of such accumulation until final acceptance of the work.

I. Adjustment Rings and Frames for Drainage Structures and Manholes. Prior to the placement of the surface course and after the placement of the binder course, when required, the Contractor shall install pre-cast concrete adjustment rings and frames for manholes and drainage units. The adjustment ring or frame shall be placed so the manhole cover or drainage unit grate will not protrude above the finished surface of the pavement. To assure a firm and secure fit with the adjustment ring or frame, the seat of the existing manhole casting or drainage unit frame shall be free of all foreign material at the time of installation. The entire assembly shall be set on the seat of the existing manhole casting or drainage unit frame and the locking devices shall be tightened evenly. The manhole cover or drainage unit grate shall then be set upon the seat of the adjustment ring or frame. The Contractor shall be responsible for insuring that the adjustment rings and frames are compatible with the existing manhole castings and covers or drainage frames and grates. All rings or frames shall be protected from displacement caused by traffic maintained on the roadway or equipment used in the paving operation. The Contractor shall have the option of removing and resetting the existing manhole casting

or drainage unit frames to the required grade where shown on the plans or approved by the Engineer.

J. Backfill. No structure shall be backfilled until all the mortar has completely set. The requirements of NYSDOT Standard Specification Section 203-3.15, Fill and Backfill at Structures, Culverts, Pipes, Conduits and Direct Burial Cable, shall apply.

3.3 FINAL INSPECTION AND ACCEPTANCE

A. The Contractor shall clean the entire drainage system of all debris and obstructions. This shall include, but not be limited to, removal of all formwork from structures, concrete and mortar droppings, construction debris and dirt. The system shall be thoroughly flushed clean and the Contractor shall furnish all necessary fluid, hoses, pumps, pipe and other equipment that may be required for this purpose. No debris shall be flushed into existing storm drains or streams. All debris shall be removed from the system.

B. The work shall not be considered as complete until the Engineer has viewed the results of for line and grade survey, and the cleanliness and workmanship requirements have been met.

END OF SECTION

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SECTION 33 41 13 - PUBLIC STORM UTILITY DRAINAGE PIPE

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. Under this section, the Contractor shall furnish and install high-density polyethylene (HDPE) drainage pipe and reinforced concrete pipe, and all necessary and required ancillary items. Drainage pipe shall be constructed to the size and type specified on the drawings and shall be laid accurately to line and grade. Work shall include providing all labor, material and equipment to perform the work as per the Contract Documents.

1.2 REFERENCED SECTIONS:

A.	Section 02 61 13	Excavation, Removal and Handling of Contaminated Material
B.	Section 31 23 00	Excavation and Fill
C.	Section 33 01 30.13	Sewer and Manhole Testing
D.	Section 33 44 13.13	Catch Basins and Trench Drains

1.3 CITED STANDARDS:

A. The installation and materials of drainage pipe shall conform to the requirements of New York State Department of Transportation Section 603.

1.4 NOTED RESTRICTIONS:

A. Obtain necessary permits from local Authorities. Ascertain and comply with local requirements for materials, construction and restoration of pavement as necessary.

1.5 QUALITY CONTROL:

A. (None listed)

1.6 SUBMITTALS:

A. Shop Drawings – Prior to deliveries, the submit copies of catalog cuts, certifications and shop drawings of the following items to the Engineer for approval:

1. Drainage Pipe and Fittings
2. Underdrain
3. Stone Filling
4. Filter Fabric

1.7 DELIVERABLES:

A. (None listed)

PART 2 PRODUCTS

2.1 MATERIALS

A. HDPE Drainage Pipe shall be N-12 pipe with water tight joints as manufactured by Advanced Drainage Systems, Inc., or from the NYSDOT Materials Bureau Approved List for polyethylene pipe, or be an Engineer Approved Equal that complies with the requirements of NYSDOT Standard Specification Section 706-12.

B. HDPE Drainage Pipe fittings with water tight joints shall be N-12 Pro Link WT as manufactured by Advanced Drainage Systems, Inc., or an Engineer Approved Equal, and shall comply with the requirements of ASTM D-3212. HDPE flared end sections and HDPE pipe end caps as manufactured by ADS-Pipe or Engineer Approved Equals shall be used where indicated on the plans.

C. Perforated HDPE pipe and fittings shall be Single Wall Perforated Pipe as manufactured by Advanced Drainage Systems, Inc., or an Engineer Approved Equal. Joints shall comply with the manufacturer's recommendations and the requirements of ASTM F405.

D. Filter fabric shall be Mirafi 160N, an approved equal from the NYSDOT Materials Bureau Approved List for geotextile, or be an Engineer Approved Equal.

E. Filter material used with the underdrain system and crushed stone for HDPE drainage pipe installations shall be crushed aggregate meeting the requirements of NYSDOT crushed stone No. 2 and be approved by the Engineer.

PART 3 EXECUTION

3.1 INSTALLATION

A. General – The Drainage Pipe system shall be installed in the locations indicated on the Drawings. Pipe shall be of the type and sizes specified and shall be laid accurately to line and grade. Work shall comply with NYSDOT Standard Specification Sections 603-3 and 604-3.

B. Submit catalog cuts as required by this section.

C. Trench Excavation and Backfill – The requirements of Section 31 23 00 – Excavation and Fill and Section 02 61 13 Excavation, Removal and Handling of Contaminated Material shall apply to the work to be done hereunder.

D. Storage and Handling – Storage of drainage materials and appurtenances on the job shall be in accordance with the manufacturer's recommendations. All drainage materials shall be protected against impact, shock, and free fall, and only equipment of sufficient capacity and proper design shall be used in handling the pipe and appurtenances.

E. Damage – Drainage materials that are defective from any cause, including damage caused by handling, will be unacceptable for installation and replaced. Pipe and/or appurtenances that are damaged or disturbed through any cause prior to acceptance of the

work, shall be repaired, realigned, or replaced.

F. Pipe Installation – Each length of Pipe shall be laid with firm, full, and even bearing throughout its entire length, in a trench prepared and maintained in accordance with Drawings and Section 31 23 00 – Excavation and Fill of these Specifications. Pipe shall be laid upgrade.

1. All drainage pipes shall have a minimum cover as indicated on the Plans.

2. Only full lengths of pipe are to be used in the installation except that partial lengths of pipe may be used at the entrance to structures where necessary to obtain a proper connection to the drainage structure. Minimum pipe length shall be 40 inches.

3. All drainage pipe entering structures shall be cut flush with the inside face of the structure, and the cut ends of the pipe and surface of the structure shall be properly rounded and finished so that there will be no protrusion, ragged edges, or imperfections that will impede the flow of water or affect the hydraulic characteristics of the installation.

4. The type of materials used as bedding and backfill and the method of placement shall conform to the requirements of Section 31 23 00 Excavation and Fill and the Contract Details.

5. The installation shall be protected at all times during construction. At all times when pipe laying is not in progress, open ends of all pipes shall be closed with a sheet of plywood anchored with soil and a piece of 2X4. If water is in the trench when work is resumed, the plywood shall not be removed until the trench has been pumped dry and all danger of water entering the pipe has been eliminated.

6. Every length of pipe shall be inspected and cleaned of all dirt and debris before being laid. Prior to the placing of a length of pipe, the end of the previously laid pipe shall be carefully and thoroughly wiped smooth and cleaned to obtain an even and close-fitting joint.

7. Pipe shall be laid accurately to the line and grade indicated on the Drawings.

8. Allowable tolerances shall be one-half (1/2) inch on grade and one (1) inch on line in any section of pipe between structures. Provide survey data to document line and grade. No adverse grades shall be allowed. See NYSDOT Section 603-3 for additional construction requirements and tolerances. Any line that has been rejected shall be rebuilt to the correct line and grade.

G. HDPE Pipe Joints – Pipes shall be watertight and have bell/spigot joints installed in compliance with the manufacturer's specifications.

H. Geotextile Fabric – Filter fabric shall be placed where and as indicated on the drawings. Ends and sides of fabric shall be lapped a minimum of twelve (12) inches.

I. Perforated HDPE pipe connections and Changes in Alignment – Pipe to pipe connections and changes in pipe alignment shall be made only with prefabricated fittings supplied by

the manufacturer of the pipe (e.g. tees, wye branches, etc.).

J. Infiltration units shall be installed as detailed in the Contract Documents and in accordance with the manufacturer's instructions.

3.2 FINAL INSPECTION AND ACCEPTANCE

A. The Contractor shall clean the entire drainage system of all debris and obstructions. This shall include, but not be limited to, removal of all formwork from structures, concrete and mortar droppings, construction debris and dirt. The system shall be thoroughly flushed clean and the Contractor shall furnish all necessary fluid, hoses, pumps, pipe and other equipment that may be required for this purpose. No debris shall be flushed into existing sewers or streams. All debris shall be removed from the system.

B. After the system has been cleaned, the Contractor shall thoroughly inspect and videotape the new system. The Contractor shall promptly make repairs ordered by the Engineer.

C. All work of cleaning and repair as specified herein shall be done at the Contractor's expense and to the complete satisfaction of the Engineer.

D. Upon completion of the work and before final acceptance by the Engineer, the entire drainage system shall be subjected to survey of inverts and a video inspection in the presence of the Engineer. The work shall not be considered as complete until the Engineer has viewed the video and all requirements for line, grade, cleanliness, and workmanship have been met.

END OF SECTION

SECTION 33 44.19.19
STORM WATER TREATMENT DEVICE

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. The Contractor shall provide all labor, materials and equipment necessary to install the Stormwater Treatment Device (SWTD) and appurtenances specified in the Drawings and specifications.

1.2 REFERENCED SECTIONS:

A. Section 31 23 00 Excavation and Fill

B. Section 02 61 13 Excavation, Removal and Handling of Contaminated Material

1.3 CITED STANDARDS:

A. NYSDOT Standard Specification Section 604 for manholes.

B. NYSDOT Standard Specification Section 655 for frames, grates and covers.

C. NYSDOT Standards Sheets, including the latest revisions of 604-01, 604-02, 655-03, 655-04 and 655-05.

1.4 NOTED RESTRICTIONS:

A. (None noted.)

1.5 QUALITY CONTROL:

A. All components shall be subject to inspection by the Engineer at the place of manufacture and/or installation. All components are subject to be rejected or identified for repair if the quality of materials and manufacturing do not comply with the requirements of this specification. Components which have been identified as defective may be subject for repair. Final acceptance of the component will be upon the discretion of the Engineer.

B. The manufacturer shall guarantee the SWTD components against all manufactured originated defects in materials or workmanship for a period of twelve (12) months from the date the components are fully installed and formally accepted by the owner. The manufacturer shall be notified of repair/replacement issues in writing within the referenced warranty period. The manufacturer shall, upon its determination of repair, correct or replace any manufacturer originated defects identified by written notice within the referenced warranty period. The use of SWTD components shall be limited to the application for which it was specifically designed.

C. The SWTD manufacturer shall submit to the Engineer of Record a “Manufacturer’s Performance certification” certifying that each SWTD is capable of achieving the specified removal efficiencies as listed in these specifications. The certification shall be supported by independent third-party research.

1.6 SUBMITTALS:

A. The Contractor shall prepare and submit shop drawings in accordance with Specifications. The shop drawings shall detail horizontal and vertical dimensioning, reinforcement and joint type and locations. The Contractor shall submit for approval the water quality performance criteria for the SWTD.

1.7 DELIVERABLES:

A. (None listed)

PART 2 PRODUCTS

2.1 MATERIALS AND DESIGN

A. Precast Concrete Components – Precast concrete components shall conform to applicable sections of ASTM C 478, ASTM C 857 and ASTM C 858 and the following:

1. Concrete shall achieve a minimum 28-day compressive strength of 4,000 pounds per square-inch (psi);

2. Unless otherwise noted, the precast concrete sections shall be designed to withstand lateral earth and AASHTO H-20 traffic loads;

3. Cement shall be Type III Portland Cement conforming to ASTM C 150;

4. Aggregates shall conform to ASTM C 33;

5. Reinforcing steel shall be deformed billet-steel bars, welded steel wire or deformed welded steel wire conforming to ASTM A 615, A 185 or A497, respectively;

6. Joints shall be sealed with preformed joint sealing compound conforming to ASTM C 990 and

7. Shipping of components shall not be initiated until a minimum compressive strength of 4,000 psi is attained or five (5) calendar days after fabrication has expired, whichever occurs first.

B. Internal Components and Appurtenances – Internal components and appurtenances shall conform to the following:

1. Screen and support structure shall be manufactured of Type 316 and 316L stainless steel conforming to ASTM F 1267-01;

2. Hardware shall be manufactured of Type 316 stainless steel conforming to ASTM A 320;

3. Fiberglass components shall conform to the National Bureau of Standards PS-15 and coated with an isophalic polyester gelcoat and

4. Access system(s) conform to the following:

   a. Manhole castings shall be designed to withstand AASHTO H-20 loadings and manufactured of cast-iron conforming to ASTM A 48 Class 30.

2.2 PERFORMANCE

A. Removal Efficiencies

1. The SWTD shall be capable of achieving a minimum of 80 percent average annual reduction in the total suspended solid (TSS) load.

2. The SWTD shall be capable of capturing and retaining 100 percent of pollutants greater than or equal to 2.4 millimeters regardless of the pollutant's specific gravity for flows up to the device's rated-treatment capacity. THE SWTD shall be designed to retain all previously captured pollutants addressed by this subsection under all flow conditions.

3. The SWTD shall be capable of capturing and retaining total petroleum hydrocarbons. The SWTD shall be capable of achieving a removal efficiency of 92 and 78 percent when the device is operating at 25 and 50 percent of its rated treatment capacity. These removal efficiencies shall be based on independent third-party research for influent oil concentrations representative of storm water runoff (20 +/- 5 mg/L). The SWTD shall be greater than 99 percent effective in controlling dry-weather accidental oil spills.

4. The SWTD shall be capable of utilizing sorbent media to enhance removal and retention of petroleum based pollutants.

B. Hydraulic Capacity

1. The SWTD shall provide rated-treatment capacity, which is consistent with governing water treatment regulations. At its rated-treatment capacity, the device shall be capable of achieving greater than 65 percent removal of particles typically found in roadside sediments. This removal efficiency shall be supported by independent third-party research utilizing samples with the NURP gradation or finer.

2. THE SWTD shall maintain the peak conveyance capacity of the drainage network as defined by the Engineer and in accordance with NYCDEP regulations.

C. Storage Capacity

1. The SWTD shall be designed with a sump chamber for the storage of captured sediments and other negatively buoyant pollutants in between maintenance cycles. The minimum storage capacity provided by the sump chamber shall be 2.1 yd3. The boundaries of the sump chamber shall be limited to that which do not degrade the SWTD's treatment efficiency as captured pollutants accumulate. The sump chamber shall separate from the treatment processing portion(s) of the

SWTD to minimize the probability of fine particle re-suspension. In order to not restrict the Owner's ability to maintain the SWTD, the minimum dimension providing access from the ground surface to the sump chamber shall be 20 inches in diameter.

2. The SWTD shall be designed to capture and retain Total Petroleum Hydrocarbons generated by wet-weather flow and dry-weather gross spills. The minimum storage capacity shall be as follows:

a. Treatment capacity: 2.88 cfs

b. Minimum Sump Capacity: 2.0 yd3

c. Minimum Oil Storage Capacity: 146 gallons

D. Sizing Criteria

1. Designed for full treatment of the runoff rate at a loading rate not to exceed the critical flow in the inlet, in order to achieve 80% TSS removal efficiency. (80% TSS removal based on an average particles size of 63 micron).

2.3 MANUFACTURER

A. The manufacturer of the SWTD shall be one that is regularly engaged in the engineering design and production of systems deployed for the treatment of storm water runoff for at least five (5) years which have a history of successful production, acceptable to the Engineer.

PART 3 EXECUTION

3.1 HANDLING AND STORAGE

A. The Contractor shall exercise care in the storage and handling of the SWTD components prior to and during installation. Any repair or replacement costs associated with events occurring after delivery is accepted and unloading has commenced shall be born by the Contractor.

3.2 INSTALLATION

A. The SWTD shall be installed in accordance with the manufacturer's recommendations and related sections of the contract documents. The manufacturer shall provide the Contractor installation instructions and offer on-site guidance during the important stages of the installation as identified by the manufacturer at no additional expense. A minimum of 72 hours notice shall be provided to the manufacturer prior to their performance of the services included under this subsection.

B. The Contractor shall fill all voids associated with lifting provisions provided by the manufacturer. These voids shall be filled with non-shrinking grout providing a finished surface consistent with adjacent surfaces. The Contractor shall trim all protruding lifting provisions flush with the adjacent concrete surface in a manner which leaves no sharp points or edges.

END OF SECTION

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SECTION 33 49 13
STORM DRAINAGE MANHOLES, FRAMES AND COVERS

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. This section includes the fabricating, furnishing, installing and constructing drainage structures in conformance with NYSDOT Standard Sheets and Specifications. The Contractor shall provide all labor, materials and equipment necessary to construct manholes in the locations shown on the plans.

1.2 REFERENCED SECTIONS:

A. Section 02 61 13 Excavation, Removal and Handling of Contaminated Material

B. Section 31 23 00 Excavation and Fill

C. Section 33 01 30.13 Sewer and Manhole Testing

D. Section 33 41 13 Public Storm Utility Drainage Pipe

E. Section 33 44 19.19 Storm Water Treatment Devices

1.3 CITED STANDARDS:

A. NYSDOT Standard Specification Section 604 for manholes.

B. NYSDOT Standard Specification Section 655 for frames, grates and covers.

C. NYSDOT Standards Sheets, including the latest revisions of 604-01, 604-02, 655-03, 655-04 and 655-05.

1.4 NOTED RESTRICTIONS:

A. Manholes shall be rectangular or a precast round alternate.

B. Provide protection during installation in accordance with Title 29 Code of Federal Regulations, Part 1926, Safety and Health Regulations for Construction (OSHA).

1.5 QUALITY CONTROL:

A. (None listed)

1.6 SUBMITTALS:

A. The Contractor shall submit shop drawings for manholes, frames, and covers. The shop drawings shall show dimensions, reinforcement, typical pipe openings, frame attachment details, slab details, and other pertinent information. The manufacturer shall certify that the design complies with NYSDOT requirements. The shop drawings shall cover all structure sizes that will be used on the project.

B. The Contractor shall submit Drill Sheets for each drainage structure based on the approved shop drawings. The Drill Sheets shall show elevations for top of frame, top of slab, bottom of slab and all inverts. The Drill Sheets shall show structure dimensions, joints, pipe nominal diameters and pipe wall opening sizes. Pipe opening sizes and locations shall comply with NYSDOT requirements and be clearly labeled on the Drill Sheets. The size of the drainage structure shall be sized accordingly to accommodate the proposed pipes. Drainage structures that are too small for the proposed pipes will not be approved.

1.7 DELIVERABLES:

A. (None listed)

PART 2 PRODUCTS

2.1 MANHOLES, FRAMES, AND COVERS

A. Materials and products shall comply with NYSDOT Standard Specification Material Requirements, including:

1.	Cast-in-Place Concrete - Class A	501
2.	Drainage Structures	604
3.	Frames and Grates	655
4.	Concrete Repair Material	701-04
5.	Concrete Grouting Material	701-05
6.	Precast Concrete Driveway and Sidewalk Pavers	704-13
7.	Premolded Resilient Joint Filler	705-07
8.	Masonry Mortar	705-21
9.	Reinforced Concrete Pipe	706-02
10.	Precast Concrete Drainage Units	706-04
11.	Bar Reinforcement, Grade 60	709-01
12.	Wire Fabric for Concrete Reinforcement	709-02
13.	Cold Drawn Wire for Concrete Reinforcement	709-09
14.	Steps for Manholes	725-02

B. All frames and covers shall accommodate HS20 loading.

C. Bedding material shall be installed under all drainage structures and consist of a

minimum of 8” of compacted crushed stone NYSDOT No. 2.

D. Submit anti-floatation calculations for structures that will be subjected to groundwater.

PART 3 EXECUTION

3.1 PREPARATION

A. Transmit submittals required by this section.

B. Furnish products as indicated.

C. Store products on site so that they are not damaged. Replace or repair any damaged structures to the satisfaction of the Engineer.

3.2 INSTALLATION

A. Excavation. Excavation shall be in conformance with the Construction Details of NYSDOT Standard Specification Section 206-3, Trench, Culvert and Structure Excavation.

B. Concrete Drainage Structures and Manholes.

1. Manholes shall be constructed in accordance with the requirements of these specifications, the NYSDOT Standard Sheets and plans. The Contractor shall have the option of erecting either cast-in-place or precast drainage structures unless specified otherwise. Cast-in-place drainage structures shall be constructed of Class A concrete and to the requirements of NYSDOT Standard Specification Section 555 Structural Concrete.

2. The Contractor shall have the option of constructing either a rectangular or circular drainage structure when such option is specified and allowed in the contract documents; option shall comply with the above Section 1.04 of this specification section. When the circular structure is selected, it shall conform to the requirements of NYSDOT Standard Specification Section 706-04 and will require submission of complete working drawings to the Engineer for review and approval. Contractor proposed changes to drainage structures shown on the Standard Sheets or on the plans, other than minor changes approved by the Engineer, shall require submission of complete working drawings to the Engineer for review and approval.

3. Unless prohibited in the contract documents, the Contractor shall have the option of reducing the size of the drainage structure riser above the uppermost pipe entry in accordance with the requirements of the NYSDOT Standard Sheets. Flat slab reducer designs proposed by the Contractor shall be subject to the review and approval of the Engineer and shall be accompanied by the following:

a. Working drawings prepared by a Professional Engineer licensed to practice in New York State.

b. The design calculations used in the preparation of the working drawings.

c. Acceptance of flat slab tops or platforms for flat slab reducer designs will be on the Basis of Proof-of-Design Test or on the Basis of Rational Design as required by ASTM C478.

C. Masonry Construction. Masonry construction, when indicated on the plans or NYSDOT Standard Sheets, shall consist of concrete pavers laid in full mortar beds. All joints shall be full mortar joints not greater than 1/2 inch wide. When specified, the outside of the masonry construction shall be plastered with 1/2 inch thick mortar coat.

D. Pipe Entries. All pipe(s) built into the wall(s) of a drainage structure shall be flush with the inside face of the drainage structure wall and shall project outside a sufficient distance to allow connection with the adjoining section. The wall knockouts and sealing the space around the pipe shall be in accordance with the NYSDOT Standard Sheets. The bell of concrete pipe shall be cut off at every pipe entry where the bell enters the drainage structure.

E. Steps. Drainage structures steps may be cast or bolted in place during construction, mortared with a concrete grouting material after the structure is completed or attached by friction locking into preformed or drilled holes. The steps shall clear all pipes. Steps in risers and conical top sections shall be aligned to form a continuous ladder with rungs equally spaced vertically in the completed structure at a maximum distance of 16 inches. Steps shall be embedded into the walls of the riser or conical top section a minimum of 3 inches. The rung shall project a minimum clear distance of 4 inches from the walls of the riser or conical sections measured from the point of embedment.

F. Frames and Grates. Frames and grates shall be as specified in the contract documents. Frames located in the top slab or top of the uppermost riser shall be secured and held in place by a minimum of 4 stirrups or studs per frame, welded to the frame near the corners. Parallel bar frames shall contain shear stud anchors, for the purpose of transferring loads, as required and detailed on the NYSDOT Standard Sheet for parallel bar grates and frames. Shear stud anchors, when required, shall replace the frame securing stirrups or studs.

G. Altering Drainage Structures and Manholes. Reconstruction and adjustment of existing drainage structures shall be as detailed and specified on the contract plans. Construction with cast-in-place concrete shall conform to the requirements of NYSDOT Standard Specification Section 555, Structural Concrete. Frames, grates and covers to be reused shall be removed, cleaned and reset at the required elevations. New frames, grates and manhole covers shall be installed when specified. Upon completion, each structure shall be cleaned of any accumulation of silt, debris or foreign matter of any kind and shall be kept clear of such accumulation until final acceptance of the work.

H. Adjustment Rings and Frames for Drainage Structures and Manholes. Prior to the placement of the surface course and after the placement of the binder course, when required, the Contractor shall install adjustment rings and frames for manholes and drainage units. The adjustment ring or frame shall be placed so the manhole cover or drainage unit grate will not protrude above the finished surface of the pavement. To assure a firm and secure fit with the adjustment ring or frame, the seat of the existing manhole casting or drainage unit frame shall be free of all foreign material at the time of installation. The entire assembly shall be set on the seat of the existing manhole casting or drainage unit frame and the locking devices shall be tightened evenly. The manhole

cover or drainage unit grate shall then be set upon the seat of the adjustment ring or frame. The Contractor shall be responsible for insuring that the adjustment rings and frames are compatible with the existing manhole castings and covers or drainage frames and grates. All rings or frames shall be protected from displacement caused by traffic maintained on the roadway or equipment used in the paving operation. The Contractor shall have the option of removing and resetting the existing manhole casting or drainage unit frames to the required grade where shown on the plans or approved by the Engineer.

I. Backfill. No structure shall be backfilled until all the mortar has completely set. The requirements of NYSDOT Standard Specification Section 203-3.15, Fill and Backfill at Structures, Culverts, Pipes, Conduits and Direct Burial Cable, shall apply.

3.3 FINAL INSPECTION AND ACCEPTANCE

A. The Contractor shall clean the entire drainage system of all debris and obstructions. This shall include, but not be limited to, removal of all formwork from structures, concrete and mortar droppings, construction debris and dirt. The system shall be thoroughly flushed clean and the Contractor shall furnish all necessary fluid, hoses, pumps, pipe and other equipment that may be required for this purpose. No debris shall be flushed into existing sewers or streams. All debris shall be removed from the system.

B. The work shall not be considered as complete until the Engineer has viewed the results of for line and grade survey, and the cleanliness and workmanship requirements have been met.

END OF SECTION

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SECTION 33 49 23
STORM DRAINAGE RETENTION STRUCTURES

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. The Contractor shall furnish and install a storm drainage retention structure as specified in the Drawings and specifications. Work shall include providing all labor, material and equipment to perform the work as per the Contract Documents.

1.2 REFERENCED SECTIONS:

A. Section 31 23 00 Excavation and Fill

B. Section 02 61 13 Excavation, Removal and Handling of Contaminated Material

1.3 CITED STANDARDS:

A. (None cited)

1.4 NOTED RESTRICTIONS:

A. (None noted)

1.5 QUALITY CONTROL:

A. (None listed)

1.6 SUBMITTALS:

A. Shop Drawings – Prior to deliveries, the submit copies of catalog cuts, certifications and shop drawings of the following items to the Engineer for approval:

1. Storm Drainage Retention System, including Materials, Layout, Fittings, Installation Instructions, and Maintenance Procedures

2. Stone Filling

3. Non-woven Geotextile

1.7 DELIVERABLES:

A. (None listed)

PART 2 PRODUCTS

2.1 MATERIALS

A. The retention system shall be constructed of perforated dual wall corrugated High Density Polyethylene pipe as manufactured by ADS or equal.

2.2 MANUFACTURER

A. The manufacturer of the storm drainage retention structures shall be one that is regularly engaged in the engineering design and production of systems deployed for the treatment of storm water runoff for at least five (5) years which have a history of successful production, acceptable to the Engineer.

PART 3 EXECUTION

3.1 INSTALLATION

A. General – The storm drainage retention structures shall be installed in the location and layout indicated on the Drawings.

B. Submit catalog cuts as required by this section.

C. Storage and Handling – Storage of materials and appurtenances on the job shall be in accordance with the manufacturer's recommendations.

D. Damage – Materials that are defective from any cause, including damage caused by handling, will be unacceptable for installation and replaced.

E. The storm drainage retention structures shall be installed as per the manufacturer's installation procedures.

F. The foundation shall support the design loading applied by the chambers and adjacent backfill weight as well as maintain its integrity during construction. A minimum of an extra foot of perimeter excavation is required for proper fit and adequate compaction. Excavation must be free of standing water. If soft or unsuitable soils are encountered, remove unsuitable material and bring back to grade with fill material as approved by the Engineer.

G. Bedding – A 6" minimum thickness, well-graded, free-draining angular washed stone ¾ to 2" particle size is the required chamber bedding. Bedding material is to be compacted to 90% AASHTO T99 standard proctor density.

H. Backfill material – Free draining angular washed stone 3/8" to 2" particle size compacted to 90% AASHTO T99 is used around the chambers. This material is used around the chambers and within a minimum of 6" below and 6" above the chambers. The remaining space should be filled with an angular, well graded granular fill meeting the requirements of AASHTO M145 A1, A2 or A3, compacted to 90% AASHTO T99. A non-woven geotextile should be used between the two layers of backfill material.

END OF SECTION

23 August 2024
Revised 19 September 2024

Mr. James Zullo AICP
Vice President
THA Consulting Inc.
144 Livingston Avenue
New Brunswick, New Jersey 08901

RE: Geotechnical Engineering Study
Ossining Multi-Modal Transportation Hub
Ossining, Westchester County, NY
Langan Project No. 190106001

Dear Mr. Zullo:

This report presents our geotechnical engineering study for the proposed multi-level transportation hub/parking garage at 5 Brandreth Street in Ossining, New York. The purposes of this study were to explore subsurface conditions, evaluate feasible foundation options, and develop geotechnical engineering recommendations. Services were performed in accordance with our authorized proposal (revised 13 June 2024).

Our approach and recommendations were developed considering:

- A plan titled "Ossining Multi-Modal Transportation Hub - Main Site" provided by THA Consulting Inc. (THA) (7 June 2024),
- An AutoCAD drawing site plan provided by THA (1 August 2024), and
- A figure of the proposed finished floor elevations provided by THA via email (25 July 2024).

Changes to the design scheme must be reviewed by Langan for impacts on our recommendations.

Elevations noted herein are taken from a survey provided by THA (1 August 2024) which references an unknown datum.

SITE DESCRIPTION

The site is bound to the north by wooded area and a residential property, to the east by Old Croton Aqueduct Trail, to the south by commercial properties, and to the west by Brandreth Street and commercial properties beyond. Figure 1 shows the site location and surrounding properties.

The site is occupied by at-grade asphalt parking lots and landscaped areas. Underground utilities including water, stormwater, and electric are present on site and in adjacent streets. Site grades generally slope downward from east to west from about elevation (el) +158 to +116. Site grades within the proposed parking structure vary from about el +146 to +119.

PROPOSED CONSTRUCTION

The proposed development is an about 22,000 square-foot (SF) footprint, 240-space, 3- to 4-story parking structure. The lowest proposed finished floor elevation (FFE) of about el +131.7 occurs at the northern quarter of the building. The eastern part of the structure ramps up to the garage entrance at the south, where the FFE is about el +137. An about 1,500 SF footprint E-Bike storage structure is also proposed off the eastern face of the proposed garage. The FFE of the E-Bike structure is unknown at this time.

Associated site features include new a new asphalt driveway, public plaza, landscape areas, and site utilities. Proposed site grading is not available at this time but based on concepts provided by THA Consulting, we assume that the existing sloping site grades outside of the parking structure will remain generally the same with minimal cuts and fills. Within the proposed parking structure footprint, cuts and fills up to about 13 and 3 feet, respectively, are anticipated to reach the proposed FFEs. Cuts up to 18 feet are likely required at the southeast elevator pit.

Additional site features include landscaped areas, utilities, site pavement. Grading plans are currently being developed, but we anticipate retaining walls up to about 4 feet to the south of the proposed structure.

Proposed structural loads were provided on a figure titled "Geotechnical Services Criteria" by THA (21 May 2024). Maximum column loads are as follows: 1,200 kips for exterior columns, 1,055 kips for interior columns, and 800 kips for corner columns. Wall footings and slab loads were not provided.

REVIEW OF AVAILABLE INFORMATION

Regional Geology

The 1989 "Surficial geologic Map of New York" (Figure 2) indicates the overburden material is glacial till. The 1970 "geological map of New York" (Figure 3) indicates the bedrock below the site is the Wappinger and Stockbridge Groups consisting of dolomite marble, calcshist, granuliate and quarzite rock. Both maps were prepared by the New York State Geological Survey.

Federal Emergency Management Agency Flood Map

We reviewed the Flood Insurance Rate Map (FIRM) published by the Federal Emergency Management Agency (FEMA), Map No. 36119C0136F effective 28 September 2007 (Figure 4). The site is located in Zone X - unshaded, "areas determined to be outside the 500-year floodplain."

SUBSURFACE EXPLORATION

Langan performed six borings (LB-01 through LB-06) within the proposed parking structure footprint. A boring location plan is provided in Figure 5.

Borings

The six borings were drilled between 10 and 12 July 2024 by Vibranalysis Inc. under full-time observation of a Langan field engineer. The borings were advanced with an Massenza MI3 track-mounted drill rig using mud-rotary drilling techniques. Borings were terminated from about 15 to 21 feet below existing grades (bottom of boring about el +109 to +127).

Standard Penetration Test N-values[1] were documented and soil samples were generally obtained continuously to a depth of 12 feet and every 5 feet thereafter. Disturbed soil samples were obtained using a standard 2-inch-outer-diameter split-spoon sampler driven by a 140-pound automatic hammer in accordance with ASTM D1586, Standard Penetration Test.

Bedrock was cored in one boring, LB-02, using a 2-⅞-inch NX double-tube core barrel. The core barrel was equipped with a diamond cutting bit in accordance with ASTM D2113, Rock Core Drilling. Rock type, percent recovery (REC)[2] and Rock Quality Designation (RQD)[3] were determined for the core run.

Recovered soil and rock samples were visually examined and classified in the field in general accordance with the Unified Soil Classification System (USCS). Soil classifications, N-values, and other field observations were recorded on our field logs provided in Appendix A.

[1] The Standard Penetration Test (SPT) is an in situ testing technique used to infer soil density and consistency. The SPT N-value is defined as the number of blows required to drive a 2-inch-diameter split-barrel sampler 12 inches after an initial penetration of 6-inches using a 140-pound hammer falling freely from 30 inches.

[2] Rock Core Recovery (REC) is defined as the ratio of the total length of rock recovered to the total core run length, expressed as a percent.

[3] The RQD is defined as the ratio of the summation of each rock piece greater than 4 inches long (for NX cores) to total core run length, expressed as a percent.

Laboratory Testing

Select samples were sent to a testing laboratory to confirm visual classifications and to determine physical and mechanical index properties. We performed four grain size determinations and four moisture content tests. See attached results provided in Appendix B.

SUBSURFACE CONDITIONS

The subsurface conditions generally consist of a surficial layer of asphalt or topsoil underlain by layers of fill, glacial till, weathered rock, and finally bedrock. Bedrock was inferred between about 15 to 21 feet below existing grades (about el +109 to +127). Groundwater was encountered in all borings, except LB-05 where it was not encountered, between about 4 and 15 feet (about el +113 to +135) below existing grades. A detailed description of subsurface materials encountered is provided below in order of increasing depth.

Surficial Materials – An about 6-inch-thick layer of asphalt was encountered in borings LB-01, LB-03, and LB-04. Subbase materials were not observed below the asphalt layer. An about 3-inch-thick layer of topsoil was encountered in borings LB-02, LB-05, and LB-06.

Fill – Below the surficial material, an about 3- to 7-foot-thick layer of fill was encountered in all borings. The fill is generally composed of orangish brown to brown sand with varying proportions of gravel, silt, roots, and brick fragments. SPT N-values were not recorded in the top 5-feet due to hand clearing for utilities. Recorded SPT N-values within the fill layer vary from about 13 to 26 blows per foot (bpf). Laboratory testing of samples within the fill layer reported a fines content between about 44 and 92% and a moisture content between about 7 and 18%. The fill layer is generally classified as silty sand to silt (SM/ML) in accordance with the USCS.

Glacial Till – Below the fill, an about 7- to 13-foot-thick layer of glacial till was encountered in all borings. The glacial till is generally composed of brown to grayish brown sand with varying proportions of gravel, silt, mica, and weathered rock fragments. SPT N-values within the till layer typically vary from about 31 bpf to split spoon refusal (less than 6 inches of penetration over 100 blows), with an average SPT N-value of 54 bpf. Laboratory testing of samples within the glacial till layer reported a fines content between about 34 and 38%. The measured moisture content was between about 10 and 11%. The glacial till layer is generally classified as a silty sand (SM) in accordance with USCS.

Weathered Rock – Below the glacial till, an about 0.5- to 5-foot-thick layer of weathered rock was encountered in all borings except for LB-05. The weathered rock is generally composed of gray gravel with varying proportions of sand, silt, and weathered rock fragments. The SPT N-values within the weathered rock layer were typically split-spoon refusal. The weathered rock displayed

the structure of the parent rock but typically broke apart under the action of the split spoon and augers. Rock was cored in LB-02 beginning at about 13.5 feet (el +130) below existing grades. The core RQD and REC is 33% and 78%, respectively. Typically, competent bedrock is assumed to have a RQD value greater than 35% and the core is therefore classified as weathered rock.

Bedrock – Bedrock was inferred in all borings by auger and split spoon refusal between about 15 and 21 feet below existing grades (between el +109 and +127). Rock elevations are shown on Figure 5.

Groundwater – Groundwater was encountered in all borings, except for LB-05 where it was not encountered, between 4 and 15 feet below existing grade (between about el +113 and +135). Perched groundwater was encountered in several borings above the recorded groundwater levels. Groundwater, if encountered, should be expected to fluctuate with seasons, flood events, precipitation, construction activities, utility breaks, etc.

GEOTECHNICAL DESIGN RECOMMENDATIONS

Seismic Design

This section presents seismic design recommendation, in accordance with the 2020 New York State Building Code (International Building Code 2018 with amendments). We have considered the soil conditions encountered in the borings to be consistent and representative of the soil conditions in the top 100 feet of soil at this site. Based on the spectral accelerations and the anticipated risk category shown in Table 1, we have estimated the Seismic Design Category (SDC). The structural engineer is responsible for confirming the appropriate use group, occupancy category, and final SDC for the proposed structure.

Table 1. Seismic Design Values

Description	Parameter	Recommended Value
Mapped Spectral Acceleration for short periods:	S_s	0.293 g
Mapped Spectral Acceleration for 1-sec period:	S_1	0.061 g
Site Class:	--	**C – Very Dense Soil /Soft Rock**
Site Coefficient:	F_a	1.3
Site Coefficient:	F_v	1.5
5% damped design spectral response acceleration at short periods:	**S_{DS}**	**0.254g**
5% damped design spectral response acceleration at 1-sec period:	**S_{D1}**	**0.061 g**
Anticipated Risk Category	--	**II**
Seismic Design Category	**--**	**B**

Liquefaction

The Building Code requires an evaluation of the liquefaction potential of non-cohesive soils below the groundwater table. The materials below the water table consist of dense soils, weathered rock, and bedrock; therefore it is our opinion that the soils at the site are not susceptible to liquefaction as defined in the Building Code.

Foundations

We recommend the structure be supported on shallow foundations bearing on structural fill, natural glacial till, or weathered rock. Where present at the bearing elevation, the existing surficial materials and fill are not suitable for foundation support and should be completely removed to the natural soils. Unsuitable materials should be removed beneath all footings and be replaced with structural fill in accordance with the Excavation, Fill, Placement, and Compaction Criteria. The removal and replacement should be performed within the foundation influence zone (1V:1H projection outward) below the bottom of foundations.

Shallow foundations can be designed using the following allowable bearing pressures:

- Structural Fill or Glacial Till – 4 kips per square foot (ksf)
- Weathered Rock – 8 ksf

Soil subgrades should be prepared in accordance with the Subgrade Preparation section of this report prior to any backfilling efforts. Over-excavation of weathered rock and bedrock is not

anticipated besides at the southeast elevator pit, and where encountered, will require a material transition zone as discussed in the Subgrade Preparation section.

For mass concrete poured directly against approved subgrade materials, the following coefficient of sliding friction values can be used and are per the New York State Building Code:

- 0.25 – Compacted structural fill, glacial till, weathered rock, and
- 0.35 - Minimum of 6-inch-thick layer of compacted clean crushed stone aggregate on top of the approved, compacted soil subgrade.

All exterior footings should be constructed 42 inches or deeper below the lowest adjacent grade for frost protection, or bear on competent rock (non-frost susceptible). Interior footings in heated spaces should be at least 1.5 feet below the finished-floor elevation. Isolated column footings should have a minimum dimension of 3 feet and strip footings should have a minimum width of 2 feet even if smaller dimensions can be justified using the recommended allowable bearing pressure. Foundations should not be located so that one foundation is within the zone of influence of an adjacent foundation, taken as a 1H:1V projection extending outward and downward from the edge of the foundation.

Foundation Settlement

Total settlement of the buildings is estimated to be 1 inch or less, provided the bearing pressures recommended here are used and the subgrade preparation work described here is performed. Differential settlements of adjacent new building columns are expected to be about ½ inch. The majority of the settlement is expected to take place during construction.

Slab Design

We recommend that ground-floor slabs and elevator pit slabs be constructed as a slab-on-grade bearing on natural soils, structural fill, or compacted existing fill prepared in accordance with the recommendations here. Slab-on-grade should be designed for a modulus of subgrade reaction of 125 pounds per cubic inch. We recommend a minimum 6-inch-thick layer of ¾-inch clean crushed stone be included beneath the slab to protect the prepared subgrade and to serve as a capillary break.

Localized areas within the parking garage will contain enclosed areas for mechanical spaces, etc. We recommend a vapor barrier be used at moisture-sensitive enclosed spaces, such as mechanical rooms, below the ground-floor slabs to limit water-vapor transmission through the slabs. We recommend a robust membrane such as the Florprufe product by GCP to limit vapor and moisture intrusion through the slab. Omission of a vapor barrier can lead to floor-covering problems including delamination and mold. If enclosed areas of the parking garage are not

sensitive to moisture, the vapor barrier may be eliminated. The structural engineer and architect should review the project documents and determine if vapor or moisture mitigation measures are necessary as part of the slab design.

Permanent Groundwater Control

Groundwater was encountered between about 4 to 21 feet below existing grades (between about el +113 to +135) across the proposed garage footprint and generally slopes with the existing surface contours. Perched groundwater was encountered in several borings above the recorded groundwater table.

Design Groundwater Elevation

Groundwater generally slope from southeast to northwest, similar to the existing ground surface. Groundwater was measured at elevations 5 feet or greater below the proposed lowest garage slab elevations, except at the southeast corner of the structure, where groundwater was encountered within about 2 feet of the proposed lowest level FFE. Due to the sloping contours around the site and variable lowest FFEs of the proposed structure, a single design groundwater elevation for the structure is likely not applicable, and therefore we recommend the permanent groundwater controls discussed below be installed around the proposed structure.

Perimeter Drains

We recommend that a perimeter drain be installed around the structure to intercept and divert groundwater flow away from the structure during prolonged precipitation, snowmelt, or utility breaks. Manufactured geocomposite drainage panels or a 12-inch-wide layer of ¾-inch clean crushed stone should be installed against the outside of all below-grade perimeter walls and should extend to within 1 foot of adjacent surface grade. Where used, drainage panels should be secured in place and the filter-fabric side must face the soil. If clean crushed stone is used, it should be wrapped with a geotextile filter fabric as noted above. The drainage panels (or crushed stone) should connect to a perforated footing drain pipe, having a minimum diameter of 6-inches, installed adjacent to the base of the footing. The footing drain should be surrounded by a minimum of 6 inches of washed ¾-inch clean crushed stone encased in a filter fabric, such as Mirafi 140N. The footing drains should be connected to the site stormwater system, and where possible, drain by gravity. Due to the grade change at the site, we believe drainage by gravity is feasible and should be coordinated with the site stormwater system by the project civil engineer.

Southeast Corner – Partial Underdrain System

At the southeast corner of the proposed structure, groundwater was encountered at about el +135. We recommend a design groundwater elevation (DGE) 3 feet above the groundwater level,

or about el +138; this is about one foot above the finished floor. We recommend a partial underdrain system be installed within the southeastern portion of the proposed structure where the lowest finished floor elevation is +137 to eliminate hydrostatic pressures acting on the slab-on-grade in this area. The final extent of the underdrain system should be determined by further exploration of field conditions or modeling of groundwater contours following changes to grading.

The underdrain system should consist of at least 12 inches of clean durable, ¾ inch, clean, crushed stone (RCA is not recommended) with 6-inch-diameter, perforated, durable interconnected, schedule 80 PVC pipes routed to internal sump pits throughout the structure. Typically, the underdrains are installed on a 15-ft grid pattern below the structure. A geosynthetic filter fabric should be placed on the prepared subgrade surface before placing the stone. Cleanouts should be placed throughout the structure such that the underdrain system can be fully flushed. We assume the underslab drainage plan and details will be included on the structural engineer's or architect's plans as part of the construction documents. We request that the slab underdrain details be provided to us for our review and comment. The civil and MEP engineers should coordinate the underdrains with the site stormwater system and confirm that any drainage can be via gravity.

Elevator Pit (Southeast corner)

The elevator pit at the southeast corner of the footprint likely extends well below the DGE of el +138. The elevator pit should be designed as a fully waterproofed structural slab and walls to resist hydrostatic pressure and uplift. The waterproofing should consist of a pre-applied positive-side composite waterproofing membrane such as Preprufe 300R manufactured by Grace Construction Products (GCP) or equivalent. Manufactured geocomposite drainage panels or a 12-inch-wide layer of ¾-inch clean crushed stone encased in filter fabric should be installed against the outside of all perimeter walls as a rigid barrier to prevent damage of the waterproofing during backfilling. Additional waterproofing measures may be necessary post-construction to remediate areas where deficiencies were created in the waterproofing membranes during construction.

Permanent Below-Grade Walls

Permanent below-grade walls which are considered to be fixed against rotation (i.e. basement walls), should be designed to resist at-rest soil and surcharge pressures. We recommend that the below-grade foundation walls (i.e. fixed walls) be designed using a triangular earth-pressure distribution having an equivalent fluid weight 60 lb/ft^2 per foot of depth. Surcharge loading on the below-grade foundation walls should be included by adding a uniform stress equal to one-half the surcharge load in addition to the soil loading. The design lateral pressures provided presume that groundwater levels coincide with the bottom of wall and the use of free-draining clean stone as backfill or a manufactured drain panel such as Hydroduct is used behind the walls. A collector

pipe (i.e. perimeter drain) should be placed at the base of the panels and routed to the site storm water system via gravity flow.

For the elevator pits that are waterproofed and designed for hydrostatic pressures, the below-grade foundation walls should be designed using a triangular earth-pressure distribution having an equivalent fluid weight 90 lb/ft^2 per foot of depth below the DGE. Surcharge loading should remain the same as above.

Temporary Excavation Support

We estimate cuts up to about 18 feet to construct the lowest level of the proposed structure and pits, and support the removal and replacement program.

Sloping and Benching

Excavation will be required for construction components including foundations, slabs, and utilities. Construction slopes should be excavated in accordance with all applicable OSHA, local, state, and federal regulations, including but not limited to proper benching and shoring. Soil stockpiles and large machinery should not be placed at the top of the temporary slopes. If temporary slopes are left open for extended periods, exposure to weathering could cause detrimental effects such as sloughing and erosion. Temporary slopes at 3H:1V may be required during periods of heavy rain, because exposed soils are susceptible to degradation.

Temporary Support of Excavation Systems

Given the existing site contours and proximity of utilities and parking areas, benching and sloping may not be feasible to reach desired subgrade elevations, and therefore a support of excavation (SOE) system may be required. The contractor should take appropriate measures to stabilize the work area and prevent lateral movement of the adjacent structures, drive aisles, and utilities during excavation. Temporary excavation support systems such as soil nails with a shotcrete face or a soldier pile and lagging wall have been used in similar subsurface conditions. The actual temporary excavation support system should be selected by the Contractor so as not to adversely impact off-site features or structures. The final excavation system will need to account for groundwater levels. Alternative options can be discussed following additional monitoring and analysis by the contractor.

The temporary excavation support should be designed to resist earth pressures, hydrostatic pressures, pavement or other surcharges (i.e. traffic loads, adjacent structures). The design of the temporary excavation support system should be such that movements are limited to tolerable levels and no adverse impact occurs to surrounding critical structures or features. The excavation support contractor should perform final design of the shoring system, including selection of the

design wall pressure. The temporary excavation support system should be designed by the contractor's licensed Professional Engineer registered in the State of New York.

Retaining Walls

Retaining walls are proposed at the south part of the site to accommodate proposed site grade changes adjacent to proposed staircases and walkways.

Gravity-type or cantilever retaining walls are feasible in cut areas, but will depend on the final location, size, and loading of the proposed walls. A geogrid reinforced modular block wall, such as Mesa, Keystone, Versa-lok, or Redi-Rock type may be feasible for use for fill areas. Site retaining walls, where movement is acceptable, can be designed using active earth pressures. The retaining wall can be preliminarily designed using a moist unit weight of 135 pounds per cubic foot, a drained angle of internal friction of 32°, and a coefficient of active earth pressure of Ka = 0.31 (or an equivalent fluid weight 45 lb/ft^2 per foot of depth). The walls should be designed for hydrostatic pressures or include drainage features to avoid water build up behind the wall face.

Additional borings should be completed along the proposed retaining wall alignments to determine allowable bearing pressures and design parameters. We anticipate wall bearing materials are similar to bearing materials below the proposed buildings, and a similar allowable bearing pressure can be used for preliminary design of the walls, provided that the subgrades are prepared in accordance with the Subgrade Preparation section of this report. Laboratory testing should be performed on actual proposed backfill materials, and adjustment of the design parameters should be made by the wall designer.

Any proposed retaining wall designs (including plans, sections, details, calculations and global stability analysis) and construction means and methods must be signed and sealed by a Professional Engineer licensed in and submitted by the contractor for review.

GEOTECHNICAL CONSTRUCTION CONSIDERATIONS

Site Preparation

All existing pavements, utilities, surficial material, and vegetation should be completely removed within 10 feet of the proposed building footprint. Below-grade structures outside of the building footprints can be abandoned in place provided they are removed to at least 4 feet below finished subgrade levels, 3 feet below proposed utilities, and to eliminate conflicts with new utilities or structures. Existing utilities outside of the proposed building footprints should be removed or abandoned in place by completely filling with grout. Existing asphalt pavement and concrete walkways should be completely removed.

Excavations made to remove below-grade elements should be backfilled with approved, compacted fill in accordance with the Excavation, Fill, Placement, and Compaction Criteria section of this report and any environmental requirements.

Clearing and grubbing of trees and vegetation designated for removal (including root systems) should be performed. Buried debris should be completely removed beneath the proposed building slab and footing locations. Any topsoil should be stripped from the proposed building and pavement areas and should be stockpiled and protected from erosion. Topsoil should be evaluated by a landscape architect for reuse in landscape areas (if permitted by the environmental engineer). All clearing and stripping activities should be performed in strict accordance with the approved soil-erosion and sediment-control plan and the environmental reports prepared for the project.

All demolition and site-clearing work should be performed in accordance with any environmental requirements established for the site, and all local, state, and federal regulations. All debris and trees and other vegetation should be properly disposed of off-site in accordance with applicable regulations. All construction work should be performed so as not to adversely impact the neighboring buildings, nearby structures or utilities, including the existing utilities and trees that are to remain. Protection of these elements should be provided as necessary. Before beginning grading or placing fill, any miscellaneous trash, debris, or other unsuitable materials should be removed from the site.

Subgrade Preparation

Soil Subgrades

All footing and utility-trench subgrades, except rock subgrades, should be proofrolled with six overlapping coverages of a double-drum 1-ton walk-behind vibratory roller. All slab subgrade areas should be proofrolled with six overlapping coverages of a vibratory drum roller having a minimum static drum weight of 10 tons.

Soft areas identified during proofrolling should be excavated and replaced with approved structural fill as described in the Excavation, Fill, Placement and Compaction Criteria section. The actual extent of necessary removal and replacement should be determined by a qualified Langan geotechnical engineer. Care should be taken when proofrolling near any existing underground utilities that are to remain.

Soil footing subgrades should be excavated level and if any cobbles or boulders are encountered at the footing subgrade level such that a relatively level subgrade is not achieved, the cobbles or boulders should be removed and replaced with compacted structural fill, compacted ¾-inch crushed stone, or lean concrete. All soil subgrades for footings or slabs should be compacted to the project specified compaction criteria.

Bedrock Subgrades

Weathered bedrock and bedrock at foundation elevations are not anticipated besides at the southeast elevator pit. If weathered rock or bedrock are encountered at bottom of footing elevation, and not designed to bear directly on bedrock, we recommend over-excavating the bedrock by 12-inches to create a sound and level bearing surface (free of debris and loose rock). A 12-inch-thick layer of ¾ inch clean crushed stone should be provided as a transition zone to limit hard spots below the foundation.

Direct bearing of foundations on competent bedrock is not anticipated.

General

Steps should be taken by the contractor to control and remove surface-water runoff and precipitation. When soil is wet and subjected to construction traffic, previously acceptable subgrades can soften and become unacceptable. A smooth drum roller should be used to seal the surface and provide for better drainage. We also recommend crowning or sloping the subgrade to provide positive drainage off the subgrades.

If foundations are not poured in a timely manner, the subgrade should be protected with a lean concrete mud mat to protect the footing subgrades.

Excavation, Fill, Placement, and Compaction Criteria

Excavation through the fill and the underlying glacial till and weathered rock can likely be performed using conventional earthmoving equipment (e.g., backhoes, excavators, dozers, etc.). The final one foot of excavations made for footings and utilities should be conducted to minimize disturbance to the subgrade (i.e., backhoe with a smooth-edge bucket). The top of bedrock was inferred to be about 15 to 21 feet below grade (between about el +109 to +127). Based on the proposed finished floor elevations of the lowest garage levels (about el +131.7 to +137), bedrock removal is not anticipated to reach bottom of footing elevations.

If encountered, limited bedrock removal can likely be performed with ripping, chipping, or other rock removal methods. The actual means and methods required for rock excavation or removal of obstructions should be selected by the contractor based upon experience and capabilities. Blasting is not anticipated, but if necessary and permitted, all blasting or rock excavation should be performed in accordance with the applicable state and local regulations and in a manner such than no on-site or off-site structures or features are adversely impacted.

All excavations should be properly sloped or braced and conform with applicable OSHA regulations including, but not limited to, temporary shoring, trench boxes, temporary rock stabilization, or proper benching or both.

The following types of fill can be used.

Structural Fill – Structural fill should be well-graded sand and gravel having a maximum particle size of 3 inches and no more than 10% passing the No. 200 sieve. Additionally, the structural fill should be free of organics, clay, roots, concrete, other non-soil constituents, and other deleterious or compressible materials. Any approved imported structural fill should be "clean fill" free of any hazardous substances and meeting all local, state, and federal regulations.

Material Reuse – The contractor may reuse the on-site fill, subsoil, glacial till, or weathered rock as structural fill provided the soils meet the requirements for structural fill outlined above and is approved by the environmental engineer. Note that samples obtained within the fill and glacial till have reported fines contents (passing the #200 sieve) of up to 92%, and will be sensitive to moisture. The overall amount of soil that can be reused will be dependent on the amount of fines present within the soil, the time of year the earthwork is carried out (e.g., potentially inclement weather), and the earthwork contractor's ability to stage, moisture conditione and process the material to facilitate placement and compaction. Bedrock may be reused if crushed to meet the structural fill materials noted above.

General Fill – On-site soils not meeting the requirements for structural fill can be used as general fill for site landscape and other nonstructural areas (e.g., landscaped areas) if environmentally suitable for reuse. The fill and subsoil layers may be used as general fill, if required.

Compaction Criteria – All fill should be placed in uniform 12-inch-thick loose lifts and compacted. Fill in landscaped areas should be compacted to 90% of its maximum dry unit weight as determined by ASTM D1557; all other fill should be compacted to at least 95%. In restricted areas where only hand-operated compactors can be used, the maximum lift thickness should be limited to 8 inches. The appropriate water content at the time of compaction should be plus or minus 2% points of optimum as determined by the laboratory compaction tests of proposed fill. No backfill should be placed on areas where free water is standing or on frozen subsoil areas.

Temporary Groundwater Control

Dewatering from surface water, perched water, and groundwater will likely be necessary during construction. Water infiltration to the foundation excavation and during construction can likely be controlled using gravity-fed sump pumps via gravel trenches or sumps assisted with collector trenches; however, the final dewatering measures required must be evaluated and designed by the contractor. Design and performance of dewatering systems are contractor's responsibility.

Care should be taken to ensure that drainage is provided during all phases of excavation work. The dewatering measures implemented should adequately dewater all foundation-related excavations, including removal and replacement, such that compaction of footing subgrades is feasible. Environmental pre-treatment of groundwater, if necessary, is beyond the scope of this study. Collected water should be discharged in accordance with applicable regulations.

SERVICES FOR DESIGN, CONSTRUCTION DOCUMENTS AND CONSTRUCTION QUALITY ASSURANCE

During final design, Langan should be retained to consult with the design team as geotechnical questions arise. Technical specifications and design drawings should incorporate our recommendations. When authorized, we will assist the design team in preparing specification sections related to geotechnical issues such as earthwork, shallow and deep foundations, backfill, and excavation support. Langan should also, when authorized, review the project plans and contractor submittals relating to materials and construction procedures for geotechnical work to confirm the designs incorporate the intent of our recommendations.

Langan has explored and interpreted the site subsurface conditions and developed the foundation design recommendations contained here, and is therefore best suited to perform quality-assurance observation and testing of geotechnical-related work during construction. The work requiring quality-assurance confirmation or special inspections per the Building Code includes, but is not limited to, earthwork, shallow and deep foundations, backfill, and excavation support.

Recognizing that construction observation is the final stage of geotechnical design, quality-assurance observation during construction by Langan is necessary to confirm the design assumptions and design elements, to maintain our continuity of responsibility on this project, and allow us to make changes to our recommendations, as necessary. The foundation system and general geotechnical construction methods recommended herein are predicated upon Langan's assisting with the final design and providing construction observation services for the owner. If Langan is not retained for these services, we cannot assume the role of geotechnical engineer of record, and the entity providing the final design and construction observation services must serve as the engineer of record.

LIMITATIONS

The conclusions and recommendations provided in this report result from our interpretation of the geotechnical conditions existing at the site inferred from a limited number of borings as well as information provided by THA Consulting Inc. Actual subsurface conditions may vary. Recommendations provided are dependent upon one another and no recommendation should be followed independent of the others. Any proposed changes in structures or their locations should be brought to Langan's attention as soon as possible so that we can determine whether

such changes affect our recommendations. Information on subsurface strata and groundwater levels shown on the logs represent conditions encountered only at the locations indicated and at the time of our exploration. If different conditions are encountered during construction, they must immediately be brought to Langan's attention for evaluation, because they may affect our recommendations. This report has been prepared to assist the owner, architect, and structural engineer in the design process and is only applicable to the design of the specific project identified. The information in this report cannot be used or depended on by engineers or contractors involved in evaluations or designs of facilities (including underpinning, grouting, stabilization, etc.) on adjacent properties beyond the limits of that which is the specific subject of this report. Environmental issues (such as permitting or potentially contaminated soil and groundwater) are outside the scope of this study and should be addressed in a separate evaluation.

CLOSING

We have appreciated being of service on this project and look forward to working with you to successfully complete this project.

Sincerely,
Langan CT, Inc.

Taylor Dalling, P.E.
Senior Project Engineer

Marc Gallagher, P.E.
Managing Principal

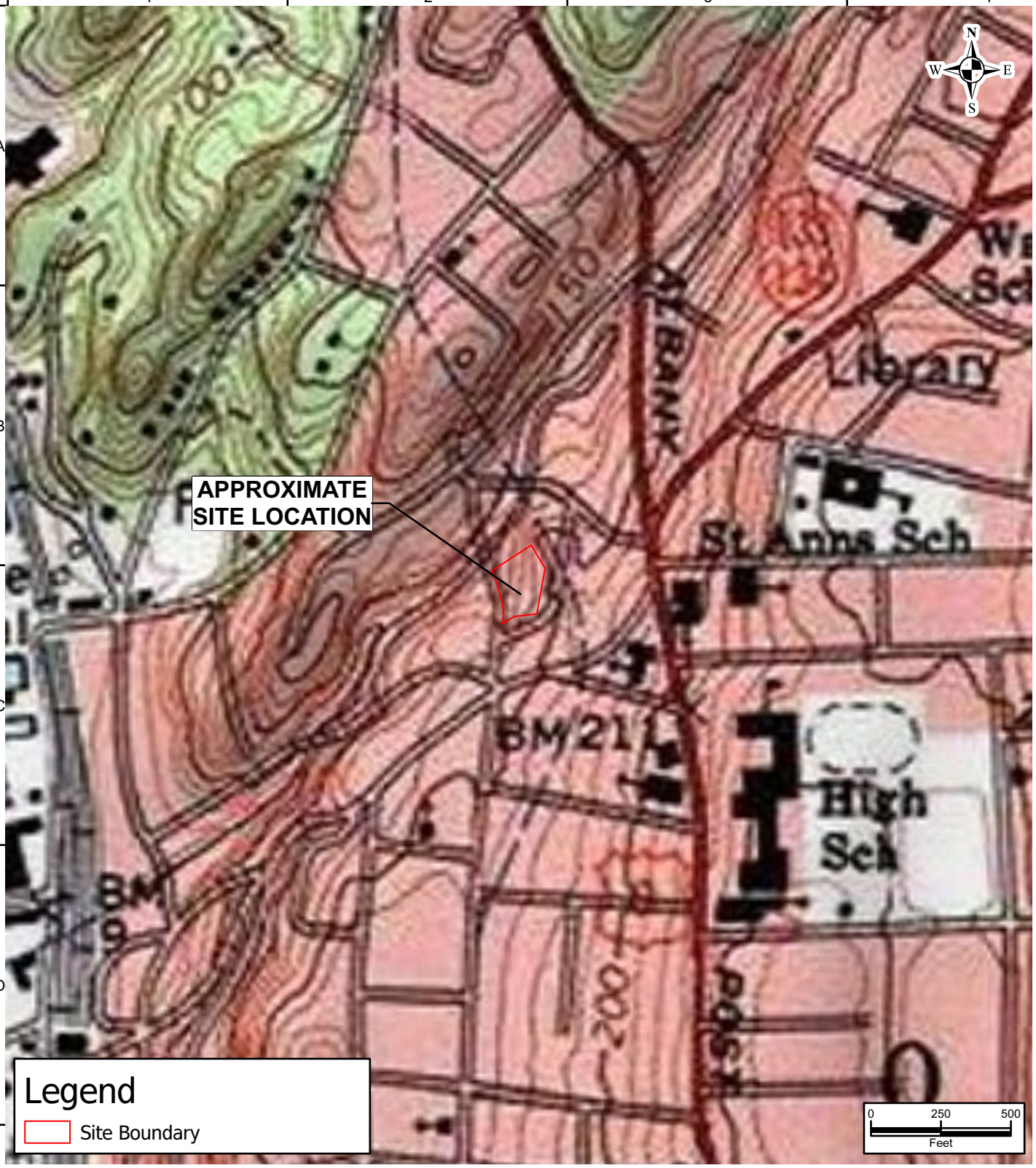
OAC/TSD:cap

\\langan.com\data\WPW\data0\190106001\Project Data_Discipline\Geotechnical\Reports\190106001_Geotechnical Letter Report_Ossining Multi-Modal Hub_DRAFT.docx

Attachments:

	Figure 1	Site Location
	Figure 2	NYS Surficial Materials Map
	Figure 3	NYS Bedrock Geology
	Figure 4	Effective FEMA Firm
	Figure 5	Boring Location Plan
	Appendix A	Langan Boring Logs
	Appendix B	Laboratory Testing Results

FIGURES



LANGAN
1 North Broadway Suite 910
White Plains NY 10601
T: 914-323-7400 F: 914-323-7401 www.langan.com
Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
Langan International
Collectively known as Langan

Project
Ossining Multi-Modal Transportation Hub

OSSINING
COUNTY
WESTCHESTER NY

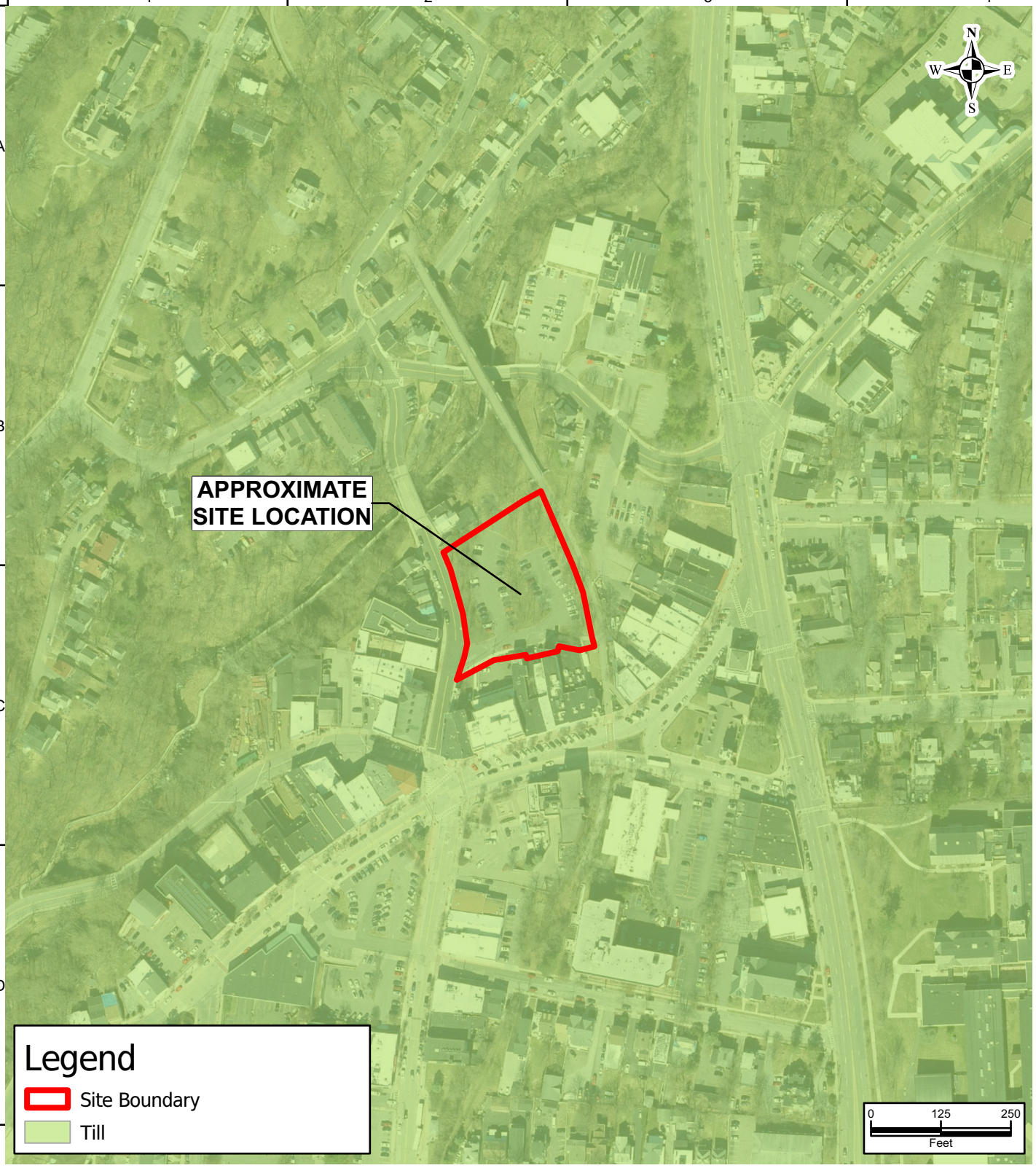
Drawing Title
SITE LOCATION

Project No.	190106001
Date	9/20/2024
Scale	1:500
Drawn By	Site Analyzer
Submission Date	9/20/2024

Figure 1

Sheet 1 of 1

Spatial Reference: NAD 1983 StatePlane New York East FIPS 3101 Feet



New York State, Maxar; ShareGIS NY | NYSGIS_GPO, New York State Education Department ("NYSED"), NYS Museum

LANGAN

1 North Broadway Suite 910
White Plains NY 10601
T: 914-323-7400 F: 914-323-7401 www.langan.com

Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
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Ossining Multi-Modal Transportation Hub

OSSINING
COUNTY
WESTCHESTER NY

Drawing Title
NYS SURFICIAL GEOLOGY MAP

Project No.	190106001
Date	8/7/2024
Scale	1:250
Drawn By	Site Analyzer
Submission Date	8/7/2024

Figure 2

Sheet 2 of 4

Disclaimer: This information is produced by an automated system and may not be complete. The absence of a feature is not a confirmation that the feature is not present at the subject location. Information produced is in the public domain and unless noted has not been field verified or provided for any specific use. Users are also cautioned to confirm the information shown is suitable for their intended use.
Spatial Reference: NAD 1983 StatePlane New York East FIPS 3101 Feet

New York State, Maxar; ShareGIS NY | NYSGIS_GPO, New York State Education Department ("NYSED"), NYS Museum

LANGAN

1 North Broadway Suite 910
White Plains NY 10601
T: 914-323-7400 F: 914-323-7401 www.langan.com

Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
Langan International
Collectively known as Langan

Project
Ossining Multi-Modal Transportation Hub

OSSINING
COUNTY
WESTCHESTER NY

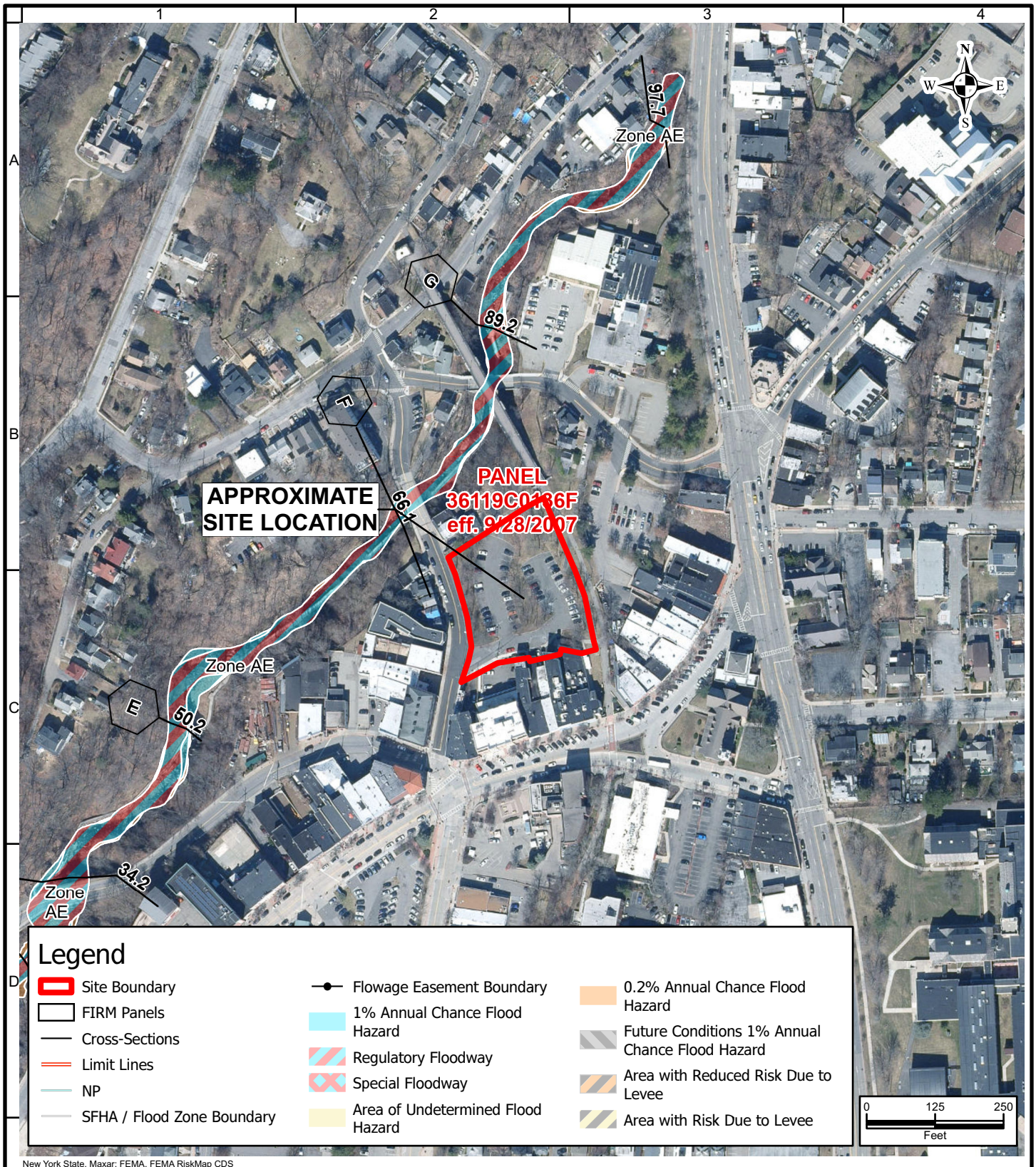
Drawing Title
NYS BEDROCK GEOLOGY MAP

Project No.	190106001
Date	8/20/2024
Scale	1:150
Drawn By	Site Analyzer
Submission Date	8/20/2024

Figure 3

Sheet 3 of 4

Spatial Reference: NAD 1983 StatePlane New York East FIPS 3101 Feet



New York State, Maxar; FEMA, FEMA RiskMap CDS

LANGAN
1 North Broadway Suite 910
White Plains NY 10601
T: 914-323-7400 F: 914-323-7401 www.langan.com
Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
Langan International
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Project
Ossining Multi-Modal Transportation Hub
OSSINING
COUNTY
WESTCHESTER NY

Drawing Title
EFFECTIVE FEMA FIRM

Project No.	190106001
Date	8/7/2024
Scale	1:250
Drawn By	Site Analyzer
Submission Date	8/7/2024

Figure 4

Sheet 4 of 4

Spatial Reference: NAD 1983 StatePlane New York East FIPS 3101 Feet

NOTES

1. ALL BORING LOCATIONS ARE APPROXIMATE.
2. ELEVATIONS REFERENCE AN UNKNOWN DATUM.
3. SITE PLAN AND SURVEY INFORMATION OBTAINED FROM A PLAN PROVIDED BY THA CONSULTING VIA EMAIL ON 1 AUGUST 2024.
4. BORINGS LB-01 THROUGH LB-06 WERE DRILLED BY VIBRANALYSIS, INC. BETWEEN 10 AND 12 JULY 2024 UNDER THE FULL-TIME OBSERVATION OF A LANGAN FIELD ENGINEER.

LEGEND

LB-XX

2024 LANGAN BORING LOCATION

PROPERTY LINE

BRANDRETH STREET

LB-01

LB-02

LB-03

LB-04

LB-05

LB-06

FFE = +137

FFE = +131.7

PROPOSED GARAGE LIMITS

OLD CROTON AQUEDUCT TRAIL

Asphalt Parking Area

Tax Lot 3

Concrete Curb

Concrete Retaining Wall

Wood Deck

Building Frame

Drop Curb

Concrete Driveway

White Line Paint Marks Parking Spaces

RAMP DOWN FROM EL +137

RAMP UP FROM EL +137

RAMP UP FROM EL +131.7

RAMP DOWN FROM EL +143

SCALE IN FEET

30 0 15 30

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Langan Engineering, Environmental, Surveying, Landscape Architecture, and Geology, D.P.C.

One North Broadway, Suite 910
White Plains, NY 10601

T: 914.323.7400 F: 914.323.7401 www.langan.com

Project	OSSINING MULTI-MODAL HUB
	OSSINING WESTCHESTER COUNTY NEW YORK
Drawing Title	BORING LOCATION PLAN
Project No.	190106001
Date	8/8/2024
Drawn By	OAC
Checked By	TSD
Drawing No.	5
Sheet	0 of 1

Project No. 190106001

Date: 8/19/2024 Time: 17:05 User: ochasse Style Table: Langan.stb Layout: Layout1 Document Code: 190106001-0101-BL101-0101

APPENDIX A
LANGAN BORING LOGS

LANGAN

Log of Boring **LB-01** Sheet 1 of 2

Project: Ossining Multi-Modal Hub	Project No.: 190106001
Location: Brandreth Street Parking Lot	Elevation and Datum: Approx. el. 136.0 (Unknown)
Drilling Company: Vibranalysis Inc.	Date Started: 7/10/2024 — Date Finished: 7/10/2024
Drilling Equipment: ATV Rig	Completion Depth: 20.3 ft — Rock Depth: 20.3 ft
Size and Type of Bit: 2-7/8in Tricone Roller Bit	Number of Samples: Disturbed 6 — Undisturbed 0 — Core 0
Casing Diameter (in): 4.00 — Casing Depth (ft): 5.0	Water Level (ft.): First ▽ N/A — Completion ▼ 9.8 — 24 HR. ▼ N/A
Casing Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	Drilling Foreman: Cyril Farley
Sampler: 2in OD Split Spoon	Field Engineer: Wingky Chen
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+136.0		0						
	+135.5	6" ASPHALT							Precleared to 5 ft depth with a 4 inch hole HA-1 from 0.5 to 3 ft.
		Orangish brown medium to fine SAND, trace fine gravel, trace silt, trace roots (moist) [FILL]	1	HA-1	HA	0			
			2						
		Grayish brown medium to fine SAND, some fine gravel, trace silt (moist) [FILL]	3	HA-2					HA-2 from 3 to 5 ft.
			4						Drive casing to 5 ft. Drill to 5 ft, smooth drilling, brown wash.
	+131.0		5						S-1 at 5 ft
		Brown medium to fine SAND, some fine gravel, trace silt (moist) [TILL]	6	S-1	SS	14	10 15 15 12	30	
		Grayish brown coarse to fine SAND, some fine gravel, trace silt, mica (moist) [TILL]	7	S-2	SS	8	12 15 50/4"	50/4"	S-2 at 7 ft
			8						Encountered refusal. Drill to 9 ft. Heavy rig chatter, brown wash. Possible boulder 9.3 ft to 10.5 ft.
			9						
			10						
		Grayish brown medium to fine SAND, some fine gravel, trace silt, mica (moist) [TILL]	11	S-3	SS	10	7 10 21 50/2"	31	S-3 at 10.5 ft
			12						Encountered refusal. Drill from 12.5 to 15 ft. Heavy rig chatterring, brown wash.
			13						
			14						
		Light brown to gray fine to medium GRAVEL, trace medium to fine sand, trace silt (wet) [TILL]	15	S-4	SS	1	10 50/3"	50/3"	S-4 at 15 ft
			16						Encountered refusal. Drill to 20 ft. Heavy rig chattering, grayish brown wash.
	+118.0		17						
			18						
			19						
			20						

LANGAN

Log of Boring **LB-01**

Project	Project No.
Ossining Multi-Modal Hub	190106001
Location	**Elevation and Datum**
Brandreth Street Parking Lot	Approx. el. 136.0 (Unknown)

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+116.0								
	+115.7	Gray fine GRAVEL, trace medium to fine sand, trace silt (wet) [WEATHERED ROCK]	20	S-5	SS	3	50/4"	50/4"	S-5 at 20 ft
		End of Boring at 20.3ft.	21						Encountered refusal.; Bottom of Boring at 20.33 ft. Boring backfilled to grade with cuttings. Patched with asphalt to match existing grade.
			22						
			23						
			24						
			25						
			26						
			27						
			28						
			29						
			30						
			31						
			32						
			33						
			34						
			35						
			36						
			37						
			38						
			39						
			40						
			41						
			42						
			43						
			44						
			45						

LANGAN

Log of Boring **LB-02** Sheet 1 of 1

Project: Ossining Multi-Modal Hub	Project No.: 190106001
Location: Brandreth Street Parking Lot	Elevation and Datum: Approx. el. 144.0 (Unknown)
Drilling Company: Vibranalysis Inc.	Date Started: 7/11/2024 — Date Finished: 7/12/2024
Drilling Equipment: ATV Rig	Completion Depth: 18.5 ft — Rock Depth: Not Encountered
Size and Type of Bit: 2-7/8in Tricone Roller Bit	Number of Samples: Disturbed 5, Undisturbed 0, Core 1
Casing Diameter (in): 4.00 — Casing Depth (ft): 5.0	Water Level (ft.): First ▽ N/A, Completion ▼ N/A, 24 HR. ▼ 9.3
Casing Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	Drilling Foreman: Cyril Farley
Sampler: 2in OD Split Spoon	Field Engineer: Wingky Chen
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+144.0								
	+143.8	3" Topsoil Light brown medium to fine SAND, some silt, trace root (moist) [FILL]	0						Precleared to 5 ft depth with a 4 inch hole; HA-1 from 0 to 3 ft.
			1	HA-1	HA	0			
			2						
		Light brown SILT, trace fine sand, trace fine gravel, trace root (moist) [FILL]	3						HA-2 from 3 to 5 ft.
			4	HA-2					Drive casing to 5 ft. Drill to 5 ft, light rig chattering, brown wash.
		Brown fine SAND, some silt, root (wet) [FILL]	5				13		S-1 at 5 ft
			6	S-1	SS	18	14 12	26	
	+137.0		7				11		
		Gray fine to medium SAND, some silt (wet) [TILL] Brown coarse to fine SAND, trace silt, mica (wet) [TILL]		S-2A			14		S-2 at 7 ft
			8	S-2B	SS	13	22 34	56	
			9				44		Drill to 9 ft. Heavy rig chattering, tan wash; S-3 at 9 ft
		Brown to gray coarse to fine SAND, trace silt, trace mica (wet) [TILL] ▽		S-3	SS	5	12 50/5"	50/5"	
			10						Observed loss of water at 10 to 18.5 ft.
			11						
			12						
			13						
	+130.2	No Recovery		S-4	SS	0	50/3"	50/3"	S-4 at 13.5 ft
		Gray micaceous GNEISS; coarse to fine grained slightly to moderately weathered; close to extremely close fracture spacing;rock quality poor; [WEATHERED ROCK]	14						Encountered refusal, spoon bouncing. Switch to NX core barrel.; C-1 at 13.5 ft
			15						
			16	C-1	NX	REC=47"/60"=78%	RQD=20"/60"=33%		
			17						
			18						
	+125.5								
		End of Boring at 18.5ft.	19						Bottom of Boring Encountered at 18.5 ft. Boring backfilled to grade with cuttings.
			20						

LANGAN

Log of Boring **LB-03** Sheet 1 of 1

Project: Ossining Multi-Modal Hub	Project No.: 190106001
Location: Brandreth Street Parking Lot	Elevation and Datum: Approx. el. 136.0 (Unknown)
Drilling Company: Vibranalysis Inc.	Date Started: 7/12/2024 — Date Finished: 7/12/2024
Drilling Equipment: ATV Rig	Completion Depth: 15.4 ft — Rock Depth: Not Encountered
Size and Type of Bit: 2-7/8in Tricone Roller Bit	Number of Samples: Disturbed 6, Undisturbed 0, Core 0
Casing Diameter (in): 4.00 — Casing Depth (ft): 5.0	Water Level (ft.): First ▽ N/A, Completion ▼ 3.8, 24 HR. ▼ N/A
Casing Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	Drilling Foreman: Cyril Farley
Sampler: 2in OD Split Spoon	Field Engineer: Wingky Chen
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

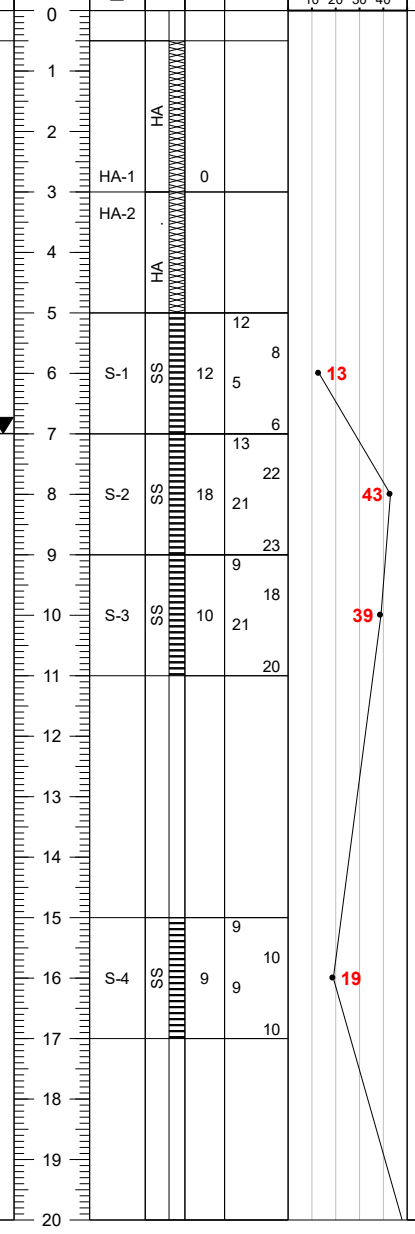
Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+136.0		0						
	+135.5	6" ASPHALT							Precleared to 5 ft depth with a 4 inch hole.
		Brown medium to fine SAND, trace fine gravel, trace silt, trace brick (moist) [FILL]	1	HA-1	HA	0			HA-1 from 0.5 to 3 ft.
			2						
		Brown medium to fine SAND, trace fine gravel, trace silt, brick (moist) [FILL]	3						HA-2 from 3 to 5 ft.
		▼	4	HA-2	HA	0			Drive casing to 5 ft. Drill to 5 ft. Smooth drilling, brown wash.
	+131.0		5				11		S-1 at 5 ft
		Grayish brown fine to medium SAND, some fine gravel, trace silt, some weathered rock fragments (moist) [TILL]	6	S-1	SS	9	20 39	59	
			7				16		S-2 at 7 ft
		Grayish brown fine to medium SAND, trace silt, trace fine gravel some weathered rock fragments (moist) [TILL]	8	S-2	SS	13	26 50 43	93	
			9				50		Drill to 9 ft. Smooth drilling, light rig chattering, brown wash.; S-3 at 9 ft
		Grayish brown silty coarse to fine SAND, trace gravel, trace weathered rock fragments (moist) [TILL]	10	S-3	SS	12	17 48 47	95	
			11				51		
	+123.0		12						
			13						
			14						
	+120.6	Gray fine GRAVEL, some coarse to fine sand, trace silt, mica (moist) [WEATHERED ROCK]	15	S-4	SS	1	50/5"	50/5"	S-4 at 15 ft
		End of Boring at 15.4ft.	16						Bottom of Boring Encountered at 15.42 ft. Boring backfilled to grade with cuttings. Patched with asphalt to match existing grade.
			17						
			18						
			19						
			20						

LANGAN

Log of Boring **LB-04** Sheet 1 of 2

Project: Ossining Multi-Modal Hub	Project No.: 190106001
Location: Brandreth Street Parking Lot	Elevation and Datum: Approx. el. 130.0 (Unknown)
Drilling Company: Vibranalysis Inc.	Date Started: 7/12/2024 — Date Finished: 7/12/2024
Drilling Equipment: ATV Rig	Completion Depth: 20.6 ft — Rock Depth: 20.6 ft
Size and Type of Bit: 2-7/8in Tricone Roller Bit	Number of Samples: Disturbed 7, Undisturbed 0, Core 0
Casing Diameter (in): 4.00 — Casing Depth (ft): 5.0	Water Level (ft.): First ▽ N/A — Completion ▼ 7.0 — 24 HR. ▼ N/A
Casing Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	Drilling Foreman: Cyril Farley
Sampler: 2in OD Split Spoon	Field Engineer: Wingky Chen
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description
	+130.0	
	+129.5	6" ASPHALT
		Brown silty medium to fine SAND, trace coarse to fine gravel, trace brick (moist) [FILL]
		Brown medium to fine SAND, some silt, trace fine gravel, trace brick (moist) [FILL]
	+123.0	
		Brown medium to fine SAND, some silt, some fine gravel, mica (moist) [TILL]
		Brown medium to fine SAND, trace silt, trace fine gravel, mica (moist) [TILL]
		Brown medium to fine SAND, some silt, some fine gravel, trace mica (moist) [TILL]
	+110.0	



Remarks

(Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)

- Precleared to 5 ft depth with a 4 inch hole.
- HA-1 from 0.5 to 3 ft.
- HA-2 from 3 to 5 ft.
- Drive casing to 5 ft. Drill to 5 ft. Smooth drilling, brown wash.
- S-1 at 5 ft
- S-2 at 7 ft
- S-3 at 9 ft
- Drill to 15 ft. Smooth drilling, brown wash.
- S-4 at 15 ft
- Drill to 20 ft. Smooth drilling, brown wash.

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Log of Boring **LB-04**

Project	Project No.
Ossining Multi-Modal Hub	190106001
Location	**Elevation and Datum**
Brandreth Street Parking Lot	Approx. el. 130.0 (Unknown)

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+110.0		20						
	+109.4	Gray fine GRAVEL, some coarse to fine sand, trace silt, mica (moist) [WEATHERED ROCK]		S-5	SS	5	31 50/1"	50/1"	S-5 at 20 ft
		End of Boring at 20.6ft.	21						Encountered refusal.; Bottom of Boring Encountered at 20.6 ft. Boring backfilled to grade with cuttings. Patched with asphalt to match existing grade.
			22						
			23						
			24						
			25						
			26						
			27						
			28						
			29						
			30						
			31						
			32						
			33						
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			35						
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			37						
			38						
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			43						
			44						
			45						

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Log of Boring **LB-05** Sheet 1 of 1

Project: Ossining Multi-Modal Hub	Project No.: 190106001
Location: Brandreth Street Parking Lot	Elevation and Datum: Approx. el. 146.0 (Unknown)
Drilling Company: Vibranalysis Inc.	Date Started: 7/11/2024 — Date Finished: 7/11/2024
Drilling Equipment: ATV Rig	Completion Depth: 19.0 ft — Rock Depth: Not Encountered
Size and Type of Bit: 2-7/8in Tricone Roller Bit	Number of Samples: Disturbed 6, Undisturbed 0, Core 0
Casing Diameter (in): 4.00 — Casing Depth (ft): 5.0	Water Level (ft.): First ▽ N/A, Completion ▼ N/A, 24 HR. ▼ N/A
Casing Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	Drilling Foreman: Cyril Farley
Sampler: 2in OD Split Spoon	Field Engineer: Wingky Chen
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+146.0							10 20 30 40	
	+145.8	3" Topsoil Brown medium to fine SAND, some silt, trace fine gravel, root, trace woody vegetation (moist) [FILL]	0						Precleared to 5 ft depth with a 4 inch hole; HA-1 from 0 to 3 ft.
			1						
			2	HA-1	HA	0			
		Light brown fine to medium SAND, some silt, trace fine gravel, trace root (moist) [FILL]	3	HA-2	HA				HA-2 from 3 to 5 ft.
			4						Drive casing to 5 ft. Drill to 5 ft. Smooth drilling, brown wash.
		Light brown fine SAND, some silt, trace root (moist) [FILL]	5	S-1A	SS	16	9 9 18		S-1 at 5 ft
	+140.1		6	S-1B			16	27	
		Brown fine GRAVEL, some medium to fine sand, trace silt (wet) [TILL]							
		Brown silty medium to fine SAND, trace fine gravel (moist) [TILL]	7						S-2 at 7 ft
			8	S-2	SS	17	19 22 28	50	
			9				24		Drill to 9 ft. Heavy rig chattering, brown wash.; S-3 at 9 ft
		Brown medium to fine SAND, some fine gravel, trace silt, root (moist) [TILL]	10	S-3	SS	10	14 19 27	46	
			11				50/2"		Drill to 15 ft. Heavy rig chattering, brown wash.
			12						
			13						
			14						
			15						S-4 at 15 ft
		Grayish brown to mottled orange fine to medium SAND, some silt, some weathered rock fragments, mica (moist) [TILL]	16	S-4	SS	7	5 10 43	53	
			17				50/2"		
			18						
			19						Encountered refusal. Drill to 20 ft. Observed possible bedrock cuttings at 19 ft. ; Bottom of Boring at 19 ft. Boring backfilled to grade with cuttings.
	+127.0	End of Boring at 19.0ft.	20						

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Log of Boring **LB-06** Sheet 1 of 1

Project: Ossining Multi-Modal Hub	Project No.: 190106001
Location: Brandreth Street Parking Lot	Elevation and Datum: Approx. el. 128.0 (Unknown)
Drilling Company: Vibranalysis Inc.	Date Started: 7/10/2024 — Date Finished: 7/10/2024
Drilling Equipment: ATV Rig	Completion Depth: 15.2 ft — Rock Depth: 15.2 ft
Size and Type of Bit: 2-7/8in Tricone Roller Bit	Number of Samples: Disturbed 7, Undisturbed 0, Core 0
Casing Diameter (in): 4.00 — Casing Depth (ft): 5.0	Water Level (ft.): First ▽ N/A, Completion ▼ N/A, 24 HR. ▼ 15.3
Casing Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	Drilling Foreman: Cyril Farley
Sampler: 2in OD Split Spoon	Field Engineer: Wingky Chen
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+128.0								
	+127.8	3" Topsoil Brown fine to medium SAND, trace fine gravel, trace silt, trace root (dry) [FILL]	0						Precleared to 5 ft depth with a 4 inch hole; HA-1 from 0 to 3ft.
			1						
			2	HA-1	HA	0			
	+125.0	Brown fine to medium SAND, some fine gravel, trace silt (dry) [TILL]	3	HA-2	HA				HA-2 from 3 to 5 ft.
			4						
		Grayish brown Gravelly medium to fine SAND, trace silt (moist) [TILL]	5				12		S-1 at 5 ft
			6	S-1	SS	15	18 18	36	
		Grayish brown medium to fine SAND, trace silt, some fine gravel (moist) [TILL]	7				13 25		S-2 at 7 ft
			8	S-2	SS	10	30 38	68	Drill to 9 ft. Smooth drilling, brown wash.
		Brown to mottled orange coarse to fine SAND, some silt, trace fine gravel (wet) [TILL]	9				34 8		S-3 at 9 ft
			10	S-3	SS	19	7 4	11	Drill to 11 ft. Smooth drilling, brown wash.
		Brown to mottled orange coarse to fine SAND, some silt, trace fine gravel (wet) [TILL]	11				10 6		S-4 at 11 ft
			12	S-4	SS	11	9 6	15	Drill to 11 ft. Smooth drilling, brown wash.; Loss of water observed at 12 ft.
			13				6		
			14						
	+113.0		15						
	+112.8	Gray fine GRAVEL, some medium to fine sand, trace silt (wet) [WEATHERED ROCK] ▽		S-5	SS		50/2"	50/2"	S-5 at 15 ft
		End of Boring at 15.2ft.	16						Encountered refusal. Bottom of Boring at 15.2 ft. Boring backfilled to grade with cuttings.
			17						
			18						
			19						
			20						

APPENDIX B
LABORATORY TESTING RESULTS

Client:	Langan Engineering				
Project:	Ossining Multi-Modal Hub				
Location:	Ossining, NY			Project No:	GTX-319502
Boring ID:	---	Sample Type:	---	Tested By:	ajl
Sample ID:	---	Test Date:	07/31/24	Checked By:	ank
Depth :	---	Test Id:	779208		

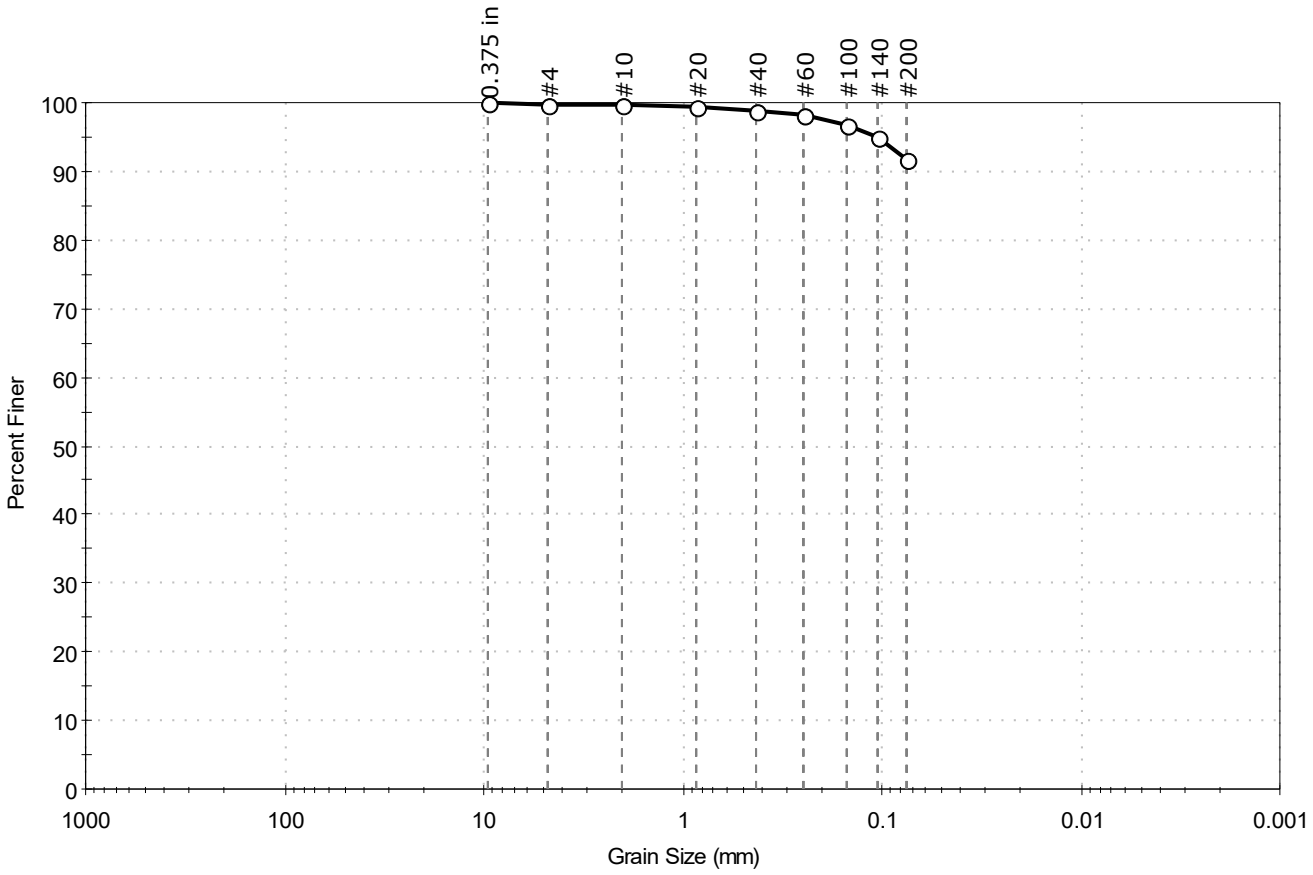
Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content,%
LB-2	HA- 2	3-5'	Moist, pale brown silt	7.2
LB-3	S- 3	9-11'	Moist, light grayish brown silty sand	10.2
LB-4	HA- 1	0-3'	Moist, dark grayish brown silty sand	17.9
LB-5	S- 2	7-9'	Moist, dark yellowish brown silty sand	11.4

Notes: Temperature of Drying : 110º Celsius

Client:	Langan Engineering				
Project:	Ossining Multi-Modal Hub				
Location:	Ossining, NY			Project No:	GTX-319502
Boring ID:	LB-2	Sample Type:	Jar	Tested By:	ajl
Sample ID:	HA-2	Test Date:	07/31/24	Checked By:	ank
Depth :	3-5'	Test Id:	779201		
Test Comment:	---				
Visual Description:	Moist, pale brown silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.2	8.0	91.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	100		
#10	2.00	100		
#20	0.85	99		
#40	0.42	99		
#60	0.25	98		
#100	0.15	97		
#140	0.11	95		
#200	0.075	92		

Coefficients

D_{85} = N/A	D_{30} = N/A
D_{60} = N/A	D_{15} = N/A
D_{50} = N/A	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

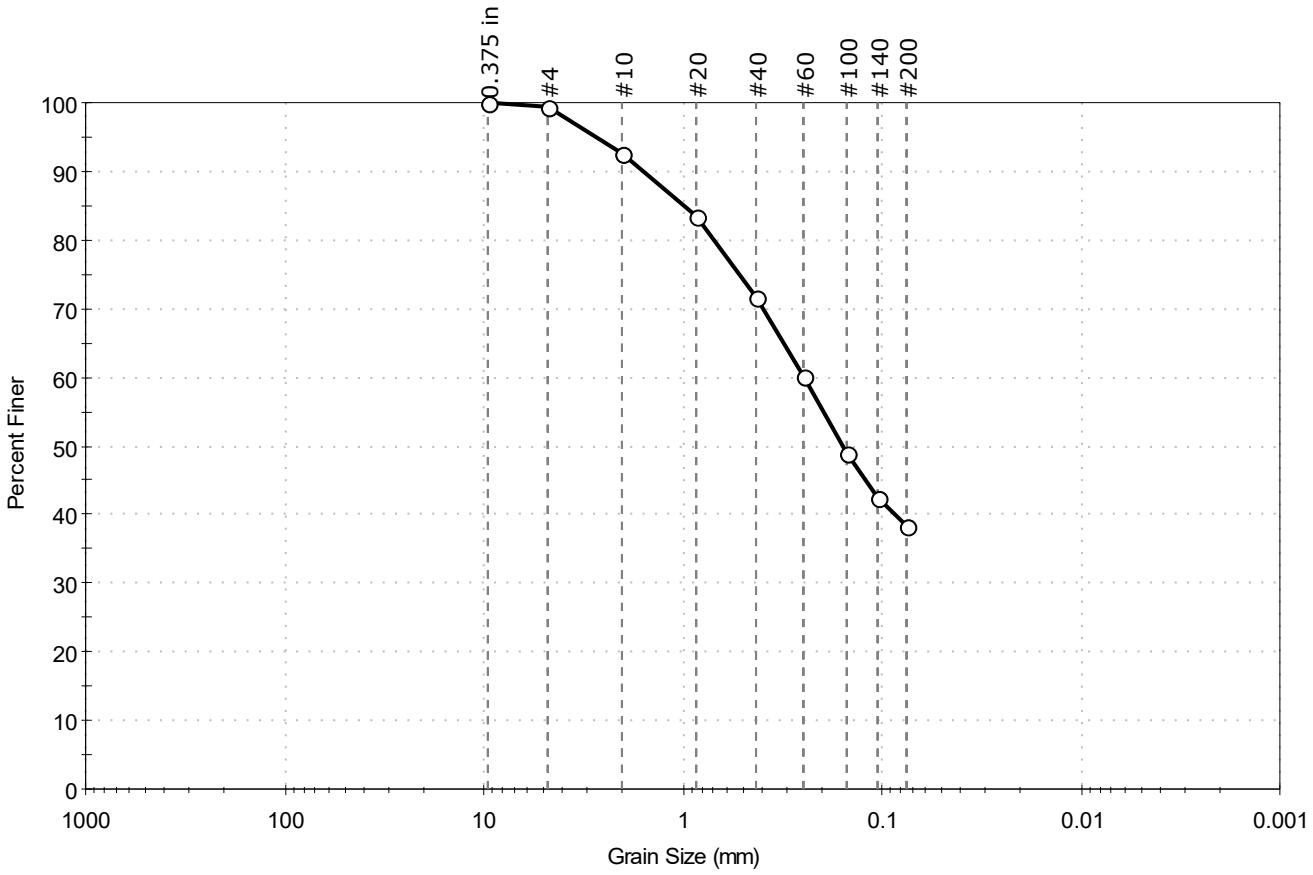
Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Client:	Langan Engineering				
Project:	Ossining Multi-Modal Hub				
Location:	Ossining, NY			Project No:	GTX-319502
Boring ID:	LB-3	Sample Type:	Jar	Tested By:	ajl
Sample ID:	S-3	Test Date:	07/31/24	Checked By:	ank
Depth :	9-11'	Test Id:	779202		
Test Comment:	---				
Visual Description:	Moist, light grayish brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.6	61.0	38.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	99		
#10	2.00	93		
#20	0.85	83		
#40	0.42	72		
#60	0.25	60		
#100	0.15	49		
#140	0.11	43		
#200	0.075	38		

Coefficients

D_{85} = 0.9817 mm D_{30} = N/A

D_{60} = 0.2465 mm D_{15} = N/A

D_{50} = 0.1569 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

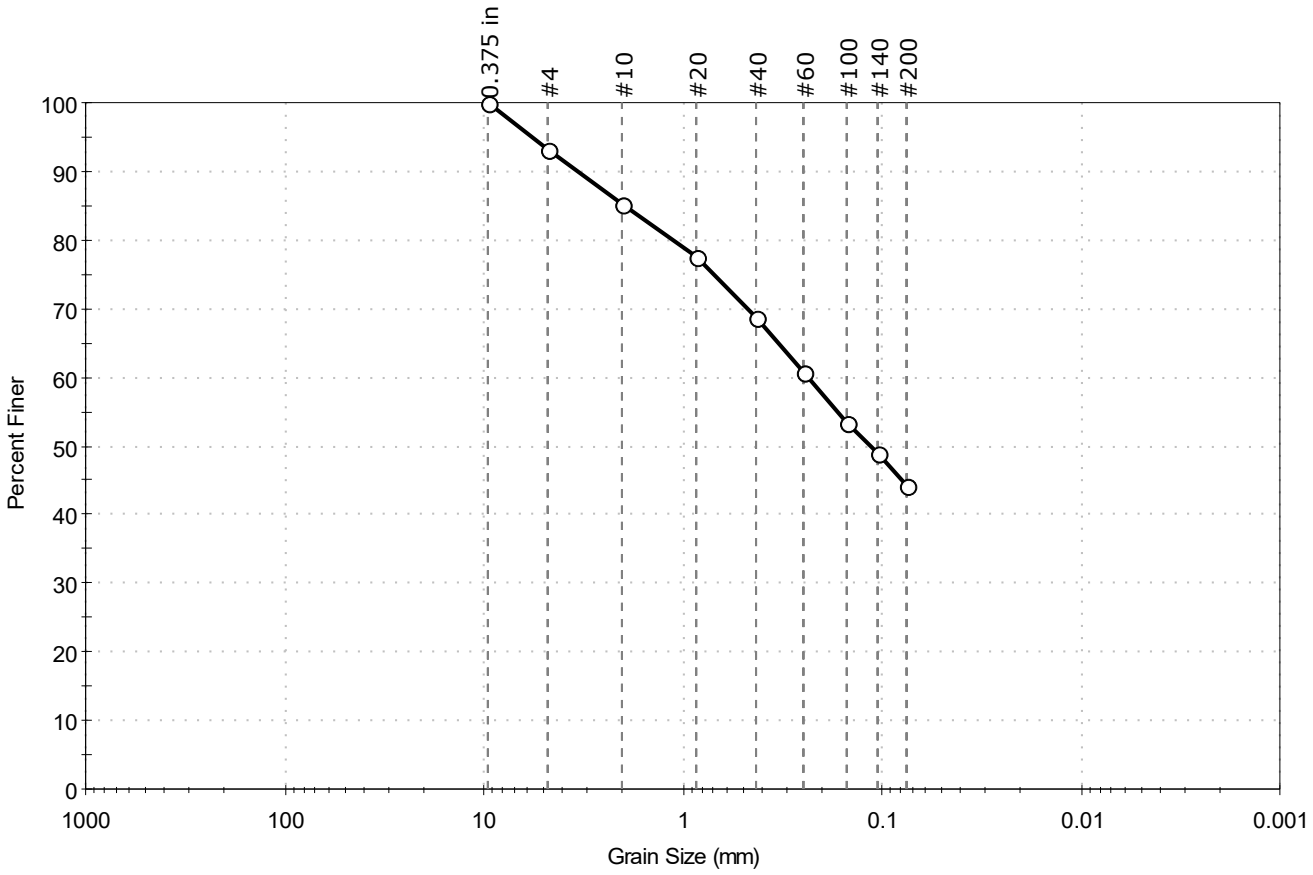
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	Langan Engineering				
Project:	Ossining Multi-Modal Hub				
Location:	Ossining, NY			Project No:	GTX-319502
Boring ID:	LB-4	Sample Type:	Jar	Tested By:	ajl
Sample ID:	HA-1	Test Date:	07/31/24	Checked By:	ank
Depth :	0-3'	Test Id:	779203		
Test Comment:	---				
Visual Description:	Moist, dark grayish brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	6.8	49.0	44.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	93		
#10	2.00	85		
#20	0.85	77		
#40	0.42	69		
#60	0.25	61		
#100	0.15	53		
#140	0.11	49		
#200	0.075	44		

Coefficients

D_{85} = 1.9530 mm D_{30} = N/A

D_{60} = 0.2350 mm D_{15} = N/A

D_{50} = 0.1140 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

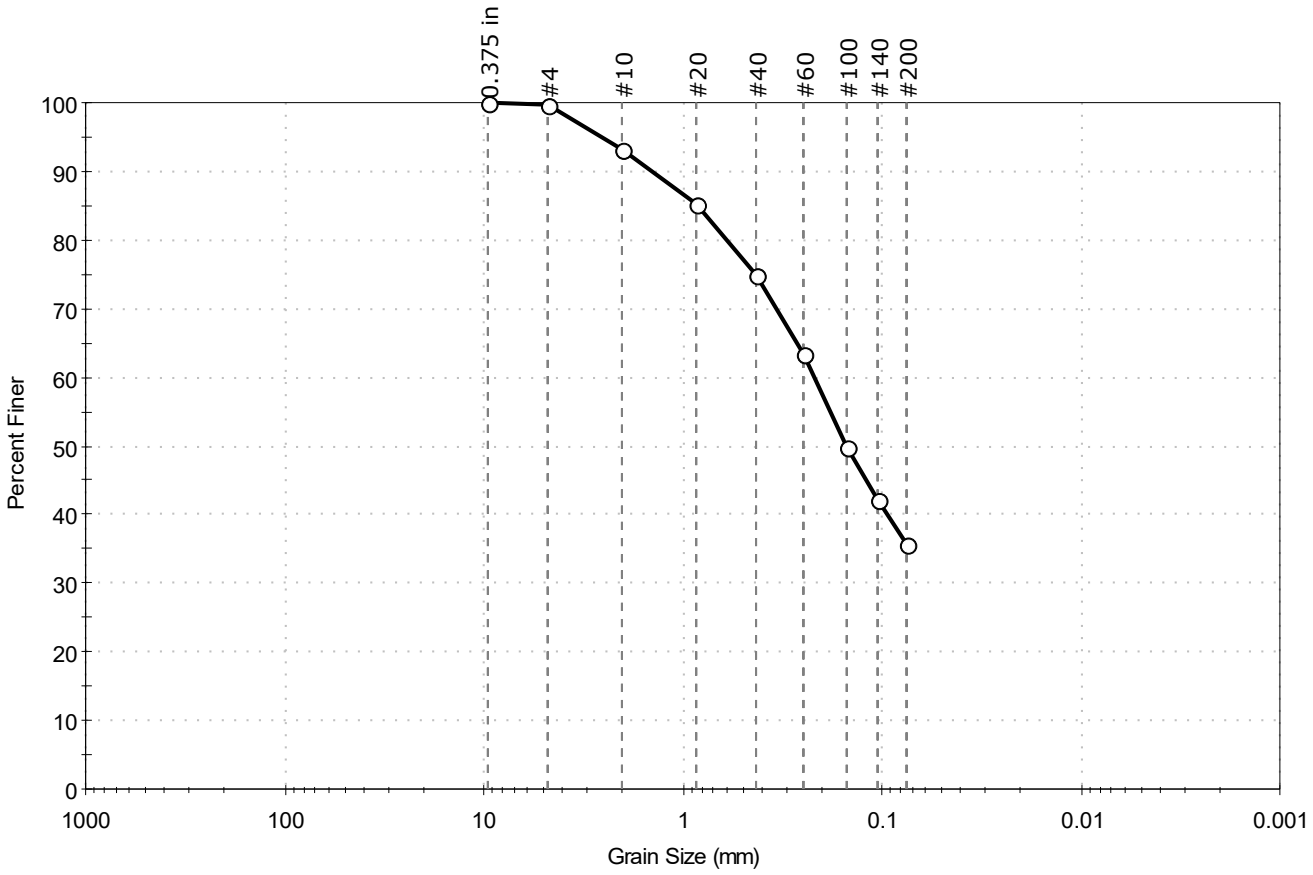
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	Langan Engineering				
Project:	Ossining Multi-Modal Hub				
Location:	Ossining, NY			Project No:	GTX-319502
Boring ID:	LB-5	Sample Type:	Jar	Tested By:	ajl
Sample ID:	S-2	Test Date:	07/31/24	Checked By:	ank
Depth :	7-9'	Test Id:	779204		
Test Comment:	---				
Visual Description:	Moist, dark yellowish brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.4	63.8	35.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	100		
#10	2.00	93		
#20	0.85	85		
#40	0.42	75		
#60	0.25	63		
#100	0.15	50		
#140	0.11	42		
#200	0.075	36		

Coefficients

D_{85} = 0.8354 mm	D_{30} = N/A
D_{60} = 0.2200 mm	D_{15} = N/A
D_{50} = 0.1512 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD