NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Division of Environmental Remediation

City of Newburgh
GAC Treatment System at Washington Lake Filtration Plant
Site Number 336089
Plumbing Construction Contract D010326
Location: Newburgh, New York

Contract Documents

ARCADIS CE, Inc.

October 2016

New York State Department of Environmental Conservation
ANDREW M. CUOMO, *Governor* BASIL SEGGOS, *Commissioner*

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SECTION I

Advertisement and Notice to Bidders

New York State Department of Environmental Conservation

Project Name: **GAC Treatment System at Washington Lake Filtration Plant**

NYS Site Number: **336089**
General Construction Contract No. **D010308**
HVAC Construction Contract No. **D010309**
Electric Construction Contract No. **D010310**
Plumbing Construction Contract No. **D010326**

Separate sealed bids for General Construction Contract No. D010308, HVAC Construction Contract No. D010309, Electric Construction Contract No. D010310 and Plumbing Construction Contract No. D010326 for the **GAC Treatment System at Washington Lake Filtration Plant** (project), will be received by the New York State Department of Environmental Conservation, Division of Management and Budget Services, 10th Floor, 625 Broadway, Albany, New York, 12233-5027, Attn: Bureau of Expenditures until the time of **1:00 P.M. prevailing local time (EST)** and on the date of **November 17, 2016**. The bids will be publicly opened and read aloud at the above time and date. Telegraphic or other electronically transferred bids are not acceptable.

The project involves the construction of a pre-engineered Granular Activated Carbon (GAC) Treatment Building, installation of Department furnished GAC Contactor Systems and GAC media and associated work at the Washington Lake Filtration Plant in the Towns of Newburgh and New Windsor, New York. Work includes, but is not limited to: 1.) Preparation of, obtaining approval for and implementing the specified and requested submittals, 2.) Furnishing and installing temporary sediment and erosion control measures, 3.) Furnishing and installing temporary facilities and controls, 4.) Site preparation, 5.) Furnishing and installing building foundations and cast-in-place hydraulic structures, 6.) Furnishing and installing a pre-engineered building system, 7.) Installation of Department furnished GAC Contactor Systems and GAC media, 8.) Furnishing and installing process piping and equipment, 9.) Furnishing and installing instrumentation and control systems, 10.) Furnishing and installing HVAC systems, 11.) Furnishing and installing electrical systems, 12.) Furnishing and installing plumbing systems, 13.) Site work and restoration. The total estimated range for this work is: **$15 Million to $20 Million.**

Contract Documents are only available in electronic format at no charge. Access to electronic copies of non-biddable Contract Document drawings, specifications, proposal forms, and addenda may be downloaded from the Department web site http://www.dec.ny.gov/chemical/59233.html. Hard copies of, and FTP link to, biddable Contract Documents, and a separate Limited Site Data Document, are available upon request from the Division of Environmental Remediation, 12th Floor, 625 Broadway, Albany, New York, 12233-7017, Attn: Benjamin Rung, P.E. - Project Manager at (518) 402-9813 or benjamin.rung@dec.ny.gov .

Proposals will be accepted only from bidders who attend the Pre-Bid Conference. All proposals must be made on the official proposal form and enclosed in the envelope which will be provided at the Pre-Bid Conference. Each proposal must be accompanied by a deposit or a bid bond in the amount of 5% of bid amount. All Bidders must attend a Pre-Bid Conference to discuss special requirements for the contract, to be held on **November 1, 2016 at City Hall, 83 Broadway, Newburgh, NY 12550, starting at 11:00 A.M. prevailing local time (EST). A site visit will follow immediately the Pre-Bid Conference. Parking is limited at the City of Newburgh Washington Lake Filtration Plant and carpooling is encouraged. Active construction is ongoing at the City of Newburgh Washington Lake Filtration Plant and any persons attending the site visit will be required to have personal protective equipment consisting of reflective safety vests, hard hats, steel toed boots and safety glasses.**

ATTENDANCE IS MANDATORY AS A CONDITION OF BIDDING.

Minority and Women Owned Business Enterprises are encouraged to submit bids in response to this solicitation. The New York State Department of Environmental Conservation is an Equal

Opportunity/Affirmative Action Employer.

The Contractor shall adhere to the *New York State Department of Environmental Conservation Guidelines Regarding Permissible Contacts During a Procurement and the Prohibition of Inappropriate Lobbying Influence*. For the purpose of this Notice to Bidders, the Director of the Division of Environmental Remediation, 12th Floor, 625 Broadway, Albany, New York, 12233-7011, shall be the Department's designated Representative. Any questions, however, shall be directed to Benjamin Rung, P.E., the Department's Project Manager and Designated Contact, at (518) 402-9813 or by email at benjamin.rung@dec.ny.gov .

Bidders may receive announcements of future procurement opportunities by signing up for the NYSDEC – DER's electronic mailing list ("GovDelivery") at https://public.govdelivery.com/accounts/NYSDEC/subscriber/new

Basil Seggos – Commissioner

SECTION II

Terms and Definitions

Wherever used in the Contract Documents the following terms (or pronouns in place of terms) have the meanings indicated which are applicable to both the singular and plural thereof:

Addenda - Written or graphic instruments issued prior to the date for opening of Bids which interpret or modify the Contract Documents by way of changes, clarifications, or corrections.

Administrative Agreement - A written explanation of the Contract Documents, signed by Department**,** Engineer and Contractor on or after the Effective Date of the Agreement and dealing with procedural or administrative aspects of the Contract Documents which do not change the contract price.

Agreement - The written agreement between Department and Contractor covering the Work to be performed; other Contract Documents are attached to the Agreement and made a part thereof as provided therein.

Application for Payment – Billing invoice in the form required by Department on which Contractor must request progress or final payments and which is to include such supporting documentation as is required by the Contract Documents.

Bid - The written offer or proposal of the Bidder, submitted pursuant to Article 5 of Section III of the Bidding Documents on the form provided.

Bidder - The person, partnership, corporation, joint venture or other combination thereof, who has submitted a Bid.

Bid Security - The security designated in the Bidding Documents to be furnished by the Bidder as guarantee that he/she will enter into a Contract with Department for the performance of the Work, if the Work involved in the Bid is awarded to that Bidder.

Bidding Documents - The Advertisement and Notice to Bidders, Bidding Information and Requirements, the Bid Forms and Attachments, and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

Bonds - Instruments of security furnished by Contractor and its surety in accordance with the Contract Documents. This refers to the labor and material payment Bond, performance Bond and those other instruments of security required by the Contract Documents.

Change Order - A document prepared and recommended by Engineer, which is reviewed by Department and has been signed by Contractor and Department and approved by Comptroller. It authorizes an addition, deletion or revision in the Work, or an adjustment in Contract Price or Contract Time, or any combination thereof, issued on or after the Effective Date of the Agreement.

Claim - Contractor=s demand or assertion seeking as a matter of right, adjustment, interpretation, additional money, extension of time or other relief with respect to terms of the Contract.

Commissioner - Commissioner of the New York State Department of Environmental Conservation.

Comptroller - The Comptroller of the New York State Office of the State Comptroller.

Contract Documents - The Agreement, Addenda (which pertain to the Contract Documents), Contractor's Bid including documentation accompanying the Bid and any post-Bid documentation submitted prior to the Notice of Award, all bid forms and attachments required by Section V, the General Conditions, the Supplementary Conditions, the Standard Specifications, the Supplementary Specifications, Appendix A, Appendix B, Measurement for Payment, Advertisement, Terms and Definitions, Bidding Information and Requirements, Supplementary Bid Information and Requirements, and the Drawings, together with all amendments, modifications and supplements issued pursuant to paragraphs 2.4 and 2.5 of Article 2 of the General Conditions on or after the Effective Date of the Agreement.

Contract Price - The money payable by Department to Contractor under the Contract Documents.

Contract Time - The number of days permitted by the Agreement for completion of Work. This number may be stated or implied by a requirement that all work be completed by a certain date.

Contractor - The person, partnership, corporation, joint venture, or other combination thereof, who has entered into the Contract with Department for the Work. The term "Contractor" means Contractor or its authorized representative.

Correction Period - The period of time within which Contractor shall promptly, without cost to Department and in accordance with Department's written instructions, either correct Defective Work or if it has been rejected by Department, remove it from the site and replace it with nondefective Work, pursuant to paragraph 12.12 of the General Conditions.

Cost and Pricing Data - Refers to all data available to and relied upon by Contractor in negotiating, pricing or performing Work covered by a Change Order or a Proposed Change Order, or involved in a claim. Sample Cost and Pricing Data include data and supporting documents pertaining to labor wages and material rates, crew mixes, labor productivity, payroll costs, price catalogs, quotations from and payments to Subcontractors, Suppliers or others, equipment production rates, equipment costs, sales and use taxes, cost of premiums for Bonds and Insurances, costs related to the determination of general and administrative overhead, site office overhead, profit, estimates and estimating guides, Contractor's computations and projections, and all of the relevant assumptions made by Contractor in pricing or figuring increases or decreases in Contract Price or Contract Time.

Cost of the Work Involved - The sum of all costs necessarily incurred and paid by Contractor in the proper performance of the Work involved.

Day - A calendar day of 24 hours lasting from midnight one day to midnight the next day.

Defective Work - Work that is unsatisfactory, faulty or deficient, or does not conform to the Contract Documents, or does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents, or has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Department at Substantial Completion in accordance with paragraphs 13.8 or 13.10).

Delivery - Shall be effected on the date of receipt by the addressee.

Department - New York State Department of Environmental Conservation.

Dispute - A Claim that is not resolved pursuant to Section VIII, Article 10 of the General Conditions becomes a Dispute to be resolved under Appendix B Article IX of the Agreement.

Department Representative(s) - Employee(s) of Department engaged in Department activities relating to the work but who is not responsible for day to day administration of the Project.

Design Engineer - The individual, partnership, corporation, joint venture, or any combination thereof, who prepared and sealed the Contract Documents that were bid by Department.

Designated Contact(s) **-** Individuals to whom all contacts can properly be made during the Restricted Period in relation to the Permissible Contacts during a Procurement and Prohibition of Inappropriate Lobbying Influence clause of the Contract Documents. The Project Manager shall serve as the **Department=s** Designated Contact for the Contract.

Designated Representative **to Resolve Disputes**- Department employee responsible for resolving all disputes between Contractor and Project Manager, as identified in the Supplementary Bidding Information and Requirements.

Drawings, Plans - The Drawings, Plans or reproductions thereof, which show location, character, dimensions, and details of the Work to be performed and which are referred to in the Contract Documents.

Effective Date of the Agreement - The date on which the Agreement is approved and filed by Comptroller.

Employee - Any person working on the project mentioned in the Contract of which these specifications are a part, and who is under the direction or control, or receives compensation from Contractor or Subcontractor.

Engineer - The individual, partnership, corporation, joint venture, or any combination thereof, any entity named as Engineer in the Agreement who will have the rights and authority assigned to Engineer in the Contract Documents. The term "Engineer" means the Engineer or its authorized representative.

Equipment - All machinery and equipment, together with the necessary supplies for upkeep and maintenance, and also tools and apparatus necessary for the proper construction and acceptable completion of the Work.

Field Order - A written order issued by Engineer to Contractor which orders minor changes in the Work in accordance with paragraph 9.2 of the General Conditions not involving an adjustment in the Contract Price or the Contract Time.

Law(s) - Applicable laws, rules, regulations, ordinances, codes or orders of a Federal or New York State court.

Material - Any approved material acceptable to Department and conforming to the requirements of the specifications.

Notice of Award - Department's written notice of Agreement approval and filing by the New York State Office of the State Comptroller and stating pertinent information with which Contractor must comply.

Notice of Intent to Award - The written notice by Department to a Bidder stating that upon compliance by that Bidder with the conditions precedent enumerated therein, within the time specified, Department intends to process contract through the appropriate New York State contract reviews.

Notice to Proceed - The written notice issued by Department to Contractor establishing the Date for Commencement of the Contract Time and, where applicable, authorizing Contractor to proceed with the Work at the site.

Overhead - General and administrative costs (whether at the site or in Contractor's principal or branch offices) and all other miscellaneous costs not assigned to a specific payment item as identified in Articles 9, 10 and 11 of the General Conditions.

Partial Utilization - Placing a portion of the Work in service for the purpose for which it is intended (or a related purpose) before reaching Substantial Completion for all the Work.

Physical Completion - The Work and all parts thereof have been completed to the satisfaction of Department.

Progress Schedule - Drawings, data computer reports, and narratives disclosing Contractor's approach to the Work; the associated Early Schedule, Late Schedule and Float times, as supported by the Critical Path Method (CPM) or Bar Chart Diagram; the Schedule of Values; and the Schedule of Shop Drawing submissions.

Project - The total construction of which the Work to be provided under the Contract Documents may be the whole, or a part as indicated elsewhere in the Contract Documents.

Project Field Representative - Department employee assigned responsibility for the day to day administration of the Project.

Progress Payment - Payment made to the Contractor as the result of a Application for Payment which accurately reflects the Contract work completed to date.

Project Manager - Department employee identified in the Supplementary Bidding Information and Requirements, responsible for administration of work required by Contract Documents and supervision of the Project Field Representative(s).

Proposed Change Order - A document prepared on a form furnished by Department which is to be used: 1) by Department when requiring that Contractor figure the potential effect on Contract Price or Contract Time of a proposed change, (the proposed change is ordered upon signing by Department), or 2) by Contractor to notify Department that in the opinion of Contractor a change is required to respond to differing or unforeseen physical conditions under which the Work is to be performed as provided in paragraph 3.11 or 3.12 of Article III of the General Conditions or to emergencies under paragraph 5.22 of Article V of the General Conditions, or has been ordered in a Field Order, or in Engineer's approval of a Shop Drawing or sample, or in Engineer's written interpretation or clarification of the requirements of the Contract Documents. When signed by Department, a Proposed Change Order may or may not fully adjust Contract Price or Contract Time, but is evidence that the change directed or documented by the Proposed Change Order will be incorporated in a subsequently issued Change Order following negotiations as to its effect, if any, on Contract Price or Contract Time.

Resident Engineer - The authorized representative of Engineer who is assigned to the site or any part thereof.

Resident Project Representative - Person acting as assistant to the Resident Engineer who is assigned to the site or any part thereof.

Resident Superintendent - The authorized representative of Contractor who is assigned to the site or any part thereof.

Restricted Period - The time period which runs from contract bid advertisement to contract approval by the New York State Office of the State Comptroller.

Retainage - A percentage of a Progress Payment withheld from a Contractor as assurance that all the contract requirements will be satisfactorily completed.

Shop Drawings - All drawings, diagrams, illustrations, schedules and other data which are specifically prepared by or for Contractor to illustrate some portion of the Work and all illustrations, brochures, standard schedules, performance charts, instructions, diagrams and other information prepared by a Supplier and submitted by Contractor to illustrate material or equipment for some portion of the Work.

Site - The area within the vertical boundaries of the location where the Contract Documents require Work by **Contractor**.

Specifications - Those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work and certain administrative details applicable thereto.

Subcontractor - An individual, partnership, corporation, joint venture or other combination thereof, having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the site.

Substantial Completion - The Work, or a specified part thereof, has progressed to the point where in the opinion of Engineer as evidenced by Engineer's definitive Certificate of Substantial Completion, it is sufficiently complete, in accordance with the Contract Documents (with the exception of the minor items identified during inspection described in paragraph 13.6 of the General Conditions), so that it can be utilized continuously for the purposes for which it is intended. Substantial Completion of the Work, or specified part thereof, may be achieved either upon completion of Pre-operational Testing or Start-up Testing, depending upon the requirements of the Contract Documents. The terms "substantially complete" and "substantially completed" as applied to any Work refer to Substantial Completion thereof.

Supplier - A manufacturer, fabricator, supplier, distributor, material man or vendor.

Testing, Pre-Operational - All testing, associated trimout activities and specified manufacturer or supplier training required prior to placing the facilities in service, including but not limited to manufacturer or supplier installation checks; leak, disinfection and pressure tests; removal or erection of temporary components; tie-ins; flushing and chemical/mechanical cleaning operations; specified performance tests; and other necessary non-operating adjustments, cold-alignment checks, corrections, housekeeping and spare parts stocking required of Contractor to demonstrate to Department and Engineer that individual components of the Work have been properly erected and do operate in accordance with the Contract Documents, and that they can be placed in service and utilized continuously for their intended purposes.

Testing, Start-Up - Follows Pre-operational Testing. Start-up Testing commences by placing portions of the Work in service under interim conditions, continues through initial utilization of the facilities under design media, and culminates with predefined trial utilization tests during which Contractor is to operate the Work, or specified parts thereof, under actual and simulated operating conditions and performing as defined in the Contract Documents, for the purposes of: a) making such minor adjustments and changes as may be found necessary to comply with the requirements of the Contract Documents, and b) complying with the Start-up Test requirements outlined in the Contract Documents.

Total Float - Number of working days by which a part of the Work identified in the progress schedule may be delayed without necessarily extending the corresponding Contract Time, or Contract Times.

Underground Facilities - All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels or other such facilities or attachments, and any encasements containing such facilities which have been installed underground to furnish any of the following services or materials: electricity, gases, steam, liquid petroleum products, chemicals, telephone or other communications, cable television, sewage and drainage removal, traffic or other control systems or water.

Work - Any and all obligations, duties, responsibilities, labor, materials, equipment, temporary facilities, and incidentals, and the furnishing thereof necessary to complete the construction assigned to, or undertaken by Contractor pursuant to the Contract Documents. Also, the entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. Work is the result of performing services, furnishing labor, and furnishing and incorporating materials and equipment into the construction, all as required by the Contract Documents.

SECTION III

Bidding Information and Requirements

ARTICLE 1 - Address for Notices

It is understood and agreed between the parties that **Department's** Representatives for the implementation of this Agreement, or for approval and direction called for therein, shall be the individuals named in Article 2 of Section IV, "Supplementary Bidding Information and Requirements."

Whenever it is provided in this Agreement that notice shall be given or other communications sent to **Department**, such notices or communications shall be delivered or sent to the Project Manager at the address set forth in Article 2 of Section IV, "Supplementary Bidding Information and Requirements." However, the Bid submittal should be addressed as stated in Article 3 below.

ARTICLE 2 - Interpretation of Bidding Documents

No interpretation of the meaning of the Bidding Documents will be made orally: all questions regarding the intent or meaning of the Bidding Documents shall be submitted in writing to the Project Manager at the address set forth in Article 2 of Section IV, "Supplementary Bidding Information and Requirements". The reply to the same, when deemed necessary, will be made available by Addenda. To be given consideration, all inquiries must be received in writing at the above address at least **ten** days prior to the date fixed for the opening of Bids. Any and all interpretations and any supplemental instructions will be in the form of written Addenda made available in electronic format. Failure of any Bidder to receive any such Addenda shall not relieve said Bidder from any obligation under its Bid as submitted. All Addenda so issued shall become part of the Bidding Documents.

All pre-bid inquiries answered by means other than Addenda shall not be binding.

ARTICLE 3 - Bid Instructions

Department invites sealed Bids on the forms attached hereto, and submitted in the envelopes provided to: Division of Management and Budget Services, New York State Department of Environmental Conservation, 10th Floor, 625 Broadway, Albany, New York, 12233-5027, **Attn.:** Bureau of Expenditures.

The outside of the envelopes must bear the name and address of the Bidder, the Project name and Project designation number from the cover of the specification book, and be clearly marked as "Bid."

Department may consider non-responsive any Bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities or irregularities in or may reject any or all Bids. Bids that are illegible or that contain any omission, erasures, alterations, additions, conditions, or items not called for in the Bidding Documents or that contain other irregularities of any kind, may be rejected as non-responsive. The failure or omission of any Bidder to obtain or examine any form, instrument, document or Bidding Documents or any part thereof, shall in no way relieve any Bidder from any obligation in respect to its Bid. Complete sets of Bidding Documents shall be used in preparing Bids; neither **Department** nor **Engineer** assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

Department is responsible for providing Addenda only to those persons or firms listed as having attended the mandatory Pre-Bid Conference.

Department and **Engineer** make copies of Bidding Documents available only for the purpose of obtaining Bids on the Work and do not authorize any other use of the Bidding Documents.

Each Bid must be submitted on the official form which is furnished by **Department**. All blank spaces in the Bid must be filled in as noted, and no change shall be made in the phraseology of the Bid or in the items mentioned therein.

The Bidder shall sign, in the space provided in the Bid form, with his or her usual signature. An officer of a corporation or a member of a partnership signing for the Bidder, shall place his or her signature and title after the word "By" under the name of the **Contractor**. The same procedure shall apply to the Bid of a joint venture by two or more Bidders; however, if the signature is by an agent or attorney-in-fact for the joint venturers, then the Bid shall be accompanied by evidence of his or her authority to act on behalf of all of the joint venturers.

The Bidder shall complete that portion of the Bid form requesting a statement of the Addenda which have been received, by Addenda number and date. If no Addenda have been received, insert the word, "NONE." Failure to complete this portion of the Bid form may result in a bid being declared non-responsive at **Department's** option.

Each Bid shall specify in words and figures, the correct gross sum, in the manner hereafter described for which the Work shall be performed according to the Bidding Documents together with a unit price expressed in words and figures for each separate items for which such a price is required. The lowest Bid shall be determined by **Department** on the basis of the total sum for which the entire Work will be performed, arrived at by a correct computation of all items specified in the Bidding Documents at the prices stated in the Bid. **Department** reserves the right to reject any Bid in which the Bid prices appear to constitute an unbalanced Bid for the work.

In the event there is a discrepancy in any Bid between the unit prices and the extended totals, the unit prices shall govern. In the event there is a discrepancy in any Bid between the prices written in figures and the unit or lump sum prices written in words, the prices written in words shall govern. **Department** may reject as non-responsive bids which do not contain a price for every numbered item contained in the Bid form, or may insert a zero for every numbered item that doesn't contain a price.

Unless **Department** gives instructions to the contrary, the Bidder shall use no more than three decimal places in the cents column under unit Bid price items. If Bidder uses more than three decimal places without such instructions, **Department** may round off the Bid item to three decimal places.

The Bidder is responsible for examining supplemental information which is available for inspection at the address for notices in Article 1 of this Section.

Department will not accept any Bid which has been transmitted via Facsimile, Telephone, Telegraph or which has been received after the designated bid opening time except where there is evidence that the bid arrived on time, but was mishandled by the **Department**. A late Bid will be returned unopened with notification of the reason for non-acceptance.

Bids will only be accepted from persons or firms who have attended the mandatory Pre-Bid Conference.

Permissible Contacts During a Procurement and Prohibition of Inappropriate Lobbying Influence -
Pursuant to State Finance Law ¼'139-j and '139-k, this contract includes and imposes certain restrictions on communications between a Governmental Entity and an Offerer/Bidder during the procurement process. An Offerer/bidder is restricted from making contacts from the earliest notice of intent to solicit bids through final award and approval of the Procurement Contract by the Department of Environmental Conservation (Department) and, if applicable, Office of the State Comptroller ("restricted period") to other than designated

staff unless it is a contact that is included among certain statutory exceptions set forth in State Finance Law ' 139-j(3)(a). Designated staff, as of the date hereof, is identified on page I-1 of Section I, Advertisement and Notice to Bidders. Department employees are also required to obtain certain information when contacted during the restricted period and make a determination of the responsibility of the Offerer/bidder pursuant to these two statutes. Certain findings of non-responsibility can result in rejection for contract award and in the event of two findings within a 4 year period, the Offerer/bidder is debarred from obtaining governmental Procurement Contracts. Further information about these requirements, including a copies of the new lobbying law, can be found at http://www.ogs.state.ny.us/aboutogs/regulations/defaultAdvisoryCouncil.html.

ARTICLE 4 - Modification or Withdrawal of Bid

Permission will not be given to modify or explain by letter, telegram, telephone or otherwise, any Bid after it has been deposited with **Department** except that a Bid may be withdrawn, modified, and resubmitted prior to the date and time for opening the Bids. After such date and time, no Bid may be withdrawn by a Bidder except as provided by law, and provided further that: 1) the Bidder files a duly signed written notice of a Bid mistake with **Department** within two business days after the day of the Bid opening, and 2) within 3 business days thereafter demonstrates to the reasonable satisfaction of **Department** that there has been a material and substantial mistake in the preparation of the Bid. If these two conditions are not met, then the bid bond would be forfeited.

Prior to submittal of Bid, a Bidder may alter or correct a unit price, or a lump sum item, which has been entered on the Bid form by crossing out the entry, entering the new figure above or below the crossed-out entry, and initialing on the line of change. The crossing out of entries shall be with ink, or typed. All new entries and initials shall be legibly handwritten with ink, or typed. Any ambiguity arising from entries altered or corrected on the Bid Form may be cause for **Department's** rejection of the Bid as non-responsive.

If the Bid is made by an individual, the business address shall be given. If made by a corporation, the names and business addresses of the president, secretary and treasurer shall be given. If made by a partnership, the names and business addresses of the partners shall be given.

Department reserves the right to disqualify Bids, before or after opening, upon evidence of collusion with intent to defraud or other illegal practices upon the part of the Bidder.

All Bids submitted by an individual, firm or partnership, a corporation or association which submits more than one Bid for the same Work under the same or different name shall be rejected.

ARTICLE 5 - Required Bid Submittals

The following are to be submitted within the time periods indicated. At the option of **Department**, failure to make or amend a submittal will constitute proof that the Bidder has abandoned all rights and interests in the contract; that the Bid Security is forfeited to **Department** as liquidated damages; and that the Work may be awarded to another Bidder in a manner consistent with Law.

a) The following items are to accompany Contractor's Bid submitted to the **Department** as required in Article 3:

X Form of Bid filled out

X Bid Bond or Certified Check

X Non-Collusion Certificate

X MacBride Fair Employment Principles (signed)

X Offerer's Affirmation of Understanding of and Agreement pursuant to State Finance Law '139-j (3) and ' 139-j (6) (b) (signed)

X Use of Best Available Retrofit Technology (BART) and Ultra Low Sulphur Diesel (ULSD) Provision (signed)

X Offerer's Disclosure of Prior Non-Responsibility Determinations (signed)

X Preliminary Progress Schedule

b) The following items shall be submitted to the Project Manager within **5 days** of notification that the Bidder is the apparent low Bidder:

X Statement of Surety's intent, complete and signed by and duly authorized surety company licensed to do business in the State of New York

X Proof of Availability of insurance or Certificate of insurance with endorsements including written verification that the insurance carrier(s) are licensed in New York State. Licensed insurance carriers can be verified at http://www.ins.state.ny.us/. If the Contractor proposes to use non-admitted carrier(s) for pollution or professional liability insurance, then three declinations on forms required by New York State Insurance Regulation 41 (i.e., Part A - Affidavit by Excess Line Broker or Part C - Affidavit by Producing Broker) must be submitted. Pollution or professional liability insurance provided by excess line carriers shall be from a carrier who is a member of the Excess Line Association of New York (ELANY). All other insurance must be through carriers licensed to do business in New York State. All carriers must be properly identified by complete name, address, National Association of Insurance Commissioners (NAIC) number and whether or not they are a member of ELANY (if applicable) in the submittal. Refer to Article 4, Bonds and Insurance, of the General Conditions for additional information.

X Completed NYS Vendor Responsibility Questionnaire (CCA-2) or an affidavit of no change (if appropriate). If the forms are filed using OSC's online VendRep System a letter, certifying that the forms have been so completed and submitted, must be sent to the Project Manager.

X M/WBE Workplan. If the forms are filed using the Department=s electronic M/WBE System a letter, certifying that the forms have been so completed and submitted must be sent to the Project Manager.

X Any other information that demonstrates the Bidder's ability to perform the work described herein

X Low bidders may be asked to submit additional information to demonstrate competency

c) The following items shall be submitted to the Project Manager within **10 days** from the date of the Notice of Intent to Award letter from **Department**:

- X Performance Bond with Power of Attorney & Surety Financial Statement (original and three copies)
- X Labor & Materials Bond with Power of Attorney & Surety Financial Statement (original & three copies)
- X Bid Breakdown of Items (original)
- X Certificates of Insurance (original and three copies)
- X Consultant/Contractor Detailed M/WBE-EEO Utilization Plan (original). If the forms are filed using the Department's electronic M/WBE System a letter, certifying that the forms have been so completed and submitted must be sent to the Project Manager.

ARTICLE 6 - Bid Security and Bonds

Bid Security shall be made payable to **Department** in an amount not less than five percent (5%) of the Bidder's gross sum Bid. The Bid Security shall be in the form of either a certified or bank check upon an incorporated bank or trust company, or a Bid Bond issued by a surety satisfactory to **Department**.

Department will accept only Bonds from a surety company licensed to write Bonds of such character and amount under the laws of New York State and which are listed on the U.S. Treasury Department Circular 570.

Attorneys-in-fact who sign Bonds shall file with such Bonds a certified copy of their Power of Attorney to sign Bonds and to conduct business in the State of New York.

The Bid Security of a Bidder awarded a Contract for the Work will be retained until such Bidder has executed the Agreement and furnished the required bonds and insurance, whereupon the Bid Security will be returned. If the Bidder fails to provide all required documents and furnish the required bonds and insurance within five (5) days after the Notice of Intent to Award, **Department** may annul the Notice of Intent to Award, and the Bid Security of that Bidder will be forfeited to **Department**. The Bid Security of any Bidder whom **Department** believes to have a reasonable chance of receiving the award may be retained by **Department** until the earlier of the 45th day after the Bid opening or seven (7) days after the Effective Date of the Agreement, whereupon Bid Security furnished by such Bidders will be returned. Bid Security of other Bidders will be returned after the Bid opening.

ARTICLE 7 - Approval of "or Equal" or Substitution Equipment, Systems or Items

There shall be no approval given by **Engineer** during the bidding period or prior to Award of Contract for any "or equal" or substitution equipment, systems or items.

ARTICLE 8 - Other Contracts and Occupancy

Department may award other contracts in connection with this Work. **Contractor** shall not have exclusive occupancy of the real property within or adjacent to the limits of the Work.

In case of interference between the operations of utility owners and different contractors, **Department** will be the sole judge of the rights of each contractor and the sequence of work necessary to expedite the completion of the entire Project. In all such cases, **Department's** decision shall be accepted as final.

ARTICLE 9 - Taxes

Department is exempt from the payment of sales and compensating use taxes of the State of New York and of cities and counties on all materials, equipment and supplies sold to **Department** pursuant to this Contract. Also exempt from such taxes are purchases by **Contractor** and its Subcontractors of materials, equipment and supplies to be sold to **Department** pursuant to this Contract, including tangible personal property to be incorporated in any structure, building or other real property forming part of the Project. These taxes are therefore not to be included in the Bid. The cost of all other taxes under the Contract shall be included in the Bid prices for the several items of the Contract.

ARTICLE 10 - Experience and Financial Statements

In accordance with New York State Executive Order No. 170, a Contract shall only be awarded to a responsible Bidder capable of performing and completing the Work in a satisfactory manner. The NYS Vendor Responsibility Questionnaire, instructions for which are included in Section V, "Bid Forms and Attachments " must be completed and submitted by the apparent low Bidder within five (5) days after the apparent low Bidder has been so notified.

Failure of the apparent low Bidder to timely submit the complete, properly executed questionnaire within three (3) days may result in disqualification.

Before **Department** will consent to any subcontracts over $10,000, the proposed subcontractor must submit the complete, properly executed "NYS Vendor Responsibility Questionnaire" through **Contractor**. Any delay in the progression of work caused by the failure of a subcontractor to comply with these requirements will be attributable to **Contractor** and any additional costs will be **Contractor's** responsibility.

The low Bidder shall demonstrate its responsibility to perform and complete Work by submitting a statement of its experience and the experience of any Subcontractor which the low Bidder intends to use to perform the Work. **Department** may require the low Bidder to further demonstrate its responsibility to perform and complete Work by submitting an additional experience and financial statement or information five (5) days after bid opening or within five (5) days of **Department** request, which shall include at a minimum, information pertaining to the Bidder's financial resources. The submitted financial information shall be certified by a Certified Public Accountant, and shall be submitted in the form required by **Department**. This can also apply to **Contractor's** subcontractors.

ARTICLE 11 - Preliminary Progress Schedule

The Preliminary Progress Schedule shall consist of three copies of a narrative description and a time-scaled critical path method diagram or bar chart diagram as specified in the Contract Documents. The narrative in the Preliminary Progress Schedule shall describe the order in which Bidder proposes to perform the Work pursuant to the specified Contract Time(s) and Work sequence conditions indicated in or required by the Bidding Documents. It shall also indicate proposed starting and completion dates for Work expressed in terms of days elapsed from the Notice to Proceed associated with each division of the Specifications within each major structure or geographical area of Work. Activities shall further identify significant submittals, approvals and associated deliveries, significant testing, major **Department** responsibilities, and responsibilities of affected utilities and third parties. The narrative shall include monthly percentages of completion for the Work in relation to the rate of progress anticipated in the Preliminary Progress Schedule.

ARTICLE 12 - Bid Breakdown

The Bid breakdown shall be submitted by the apparent low Bidder within five (5) days after the date of the Notice of Intent to Award letter. Discrepancies, ambiguities or conflicts in the Bid breakdown shall be

resolved in accordance with the terms and conditions set forth in Article 8.10 of Section VIII the General Conditions.

A Bidder submitting a Bid breakdown and awarded a Contract for the Work agrees and understands that those prices for separable parts of the Work disclosed on the Bid breakdown, where they are applicable and determined to be reasonable by **Department** may be used for the purposes of: a) measurement and payment, b) increase(s) or decrease(s) in the Contract Price due to adjustments in quantities to the separable parts of the Work, and c) Change Orders or Proposed Change Orders which add or deduct like Work.

ARTICLE 13 - Subsurface and Technical Information

If boring logs and other subsurface information were made available for the inspection of Bidders, please note that such data were obtained with reasonable care and were recorded in good faith by **Department**, **Engineer** or the **Design Engineer**.

The soil and rock descriptions shown are as determined by a visual inspection of the samples from the various explorations unless otherwise noted. The observed water levels and/or water conditions indicated thereon are as recorded at the time of the exploration. These levels and/or conditions may vary considerably, according to the prevailing climate, rainfall and other factors, including the passage of time.

When reports showing data obtained by investigations and tests at the site by **Department**, **Engineer** or the **Design Engineer** are included with the Bidding Documents, or made available to Bidders as set forth in the Bidding Documents, it is expressly understood and agreed that technical data, but not any non-technical data, interpretations or opinions contained in such reports, are incorporated by reference into the Contract Documents. Bidders may rely upon the accuracy of all such technical data contained in such reports as to where (location) and when (exact time) such technical data was obtained, unless the Bidding Documents limit any other basis upon which such technical data may be relied upon. It is further expressly understood and agreed that the use of any technical data contained in such reports is subject to all of the conditions and limitations set forth in the Bidding Documents.

Subsurface and technical information is made available to Bidders in good faith so that they may be aware of the information utilized for design and estimating purposes. **Department** makes no representations or warranties, express or implied, as to the completeness of this information or data, nor is such disclosure intended as a substitute for personal investigations, interpretations, and judgment of the Bidder.

ARTICLE 14 - Underground Facilities

The locations of Underground Facilities were ascertained with reasonable care and recorded in good faith from various sources, including the records of municipal and other public service corporations, and therefore such locations may only be approximate. **Department** does not assume responsibility for the accuracy or completeness of such locations.

ARTICLE 15 - Examination of Bidding Documents and Site

It is the responsibility of each Bidder, before submitting a Bid to: a) examine the Bidding Documents thoroughly, b) visit and visually inspect the site during the Pre-Bid Conference required pursuant to Article 3 of Section IV, "Supplementary Bidding Information and Requirements," c) become familiar with local conditions that may affect cost, schedule, performance or furnishing of the Work, d) become familiar with applicable Laws that may in any manner affect cost, schedule, performance or furnishing of the Work, e) study and carefully correlate Bidder's observations with the Bidding Documents, and f) notify the Project Manager identified in Article 1 of this section promptly after discovering any conflicts, ambiguities, errors or inconsistencies in the Bidding Documents.

It is the responsibility of each Bidder to obtain any additional documents, information or data which pertain to the physical conditions (surface, subsurface and Underground Facilities) at or contiguous to the site which may affect cost, schedule, progress, performance or furnishing of the Work and which Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the Bidding Documents.

The submission of a Bid constitutes an incontrovertible representation by Bidder that Bidder has taken steps reasonably necessary to ascertain the nature and location of the Work, and that Bidder has investigated and accounted for in the preparation of the Bid: a) Governmental requirements and all reasonably foreseeable general and local conditions that may affect cost, schedule, performance or furnishing of the Work. Examples of such conditions include: 1) conditions bearing upon the transportation, disposal, handling and storage of materials, 2) the availability and suitability of labor, water, electric power, telephone, sanitary services, and roads, 3) weather, river stages, tides or similar conditions at or contiguous to the site, 4) physical conditions of the site, and 5) the character of equipment and facilities needed preliminary to and during Work performance, b) character, quality and quantity of surface, subsurface and Underground Facilities at or contiguous to the site insofar as this information is reasonably ascertainable from the Drawings and Specifications included as part of the Bidding Documents, from the reports referenced in the Supplementary Bid Information and from the documents, information and data regarding physical conditions at or contiguous to the site obtained by Bidder, and c) Bidding Documents to be sufficient in scope and detail to indicate and convey understanding of all terms and conditions affecting cost, schedule, performance and furnishing of the Work.

Any Failure to take the actions described in this Article will not relieve that Bidder from responsibility for estimating properly the difficulty, cost of, and schedule for successfully performing the Work, or from performing the Work successfully without an increase in Contract Price or an extension in Contract Time.
Department, **Engineer,** or **Design Engineer** do not assume any responsibility for any conclusions or interpretations made by any Bidder based on the information made available by the Bidding Documents. Nor does **Department**, or **Engineer** assume any responsibility for any understanding reached or representation made concerning conditions which can affect the cost, schedule, progress, furnishing and performance of the Work prior to execution of the Contract, unless that understanding or representation is expressly stated in the Bidding Documents.

In an itemized contract, the estimate of quantities of work to be done and materials to be furnished is approximate and is given only as a basis of calculation upon which the award of the contract is to be made. **Department** does not assume any responsibility that the quantities estimated will be the actual quantities required; **Contractor** may not claim misunderstanding or deception because of such estimates of quantities or of the character of the work, location, or other condition pertaining thereto. **Department** may increase or diminish any or all of the quantities of work mentioned above or omit any of them, as deemed necessary.

ARTICLE 16 - Subcontractors, Suppliers or Others

Unless otherwise agreed in writing by **Department**, **Contractor** shall subcontract no more than the percentage (%) of the total cost of the work under its contract as may be provided by the Contract Documents in Article 6 of Section IV, "Supplementary Bidding Information and Requirements". Procedures for approval of Subcontractors, Suppliers or other persons or organizations, after execution of the Agreement, are set forth in the General Conditions and the Supplementary Conditions.

ARTICLE 17 - Award of Contract

The Contract(s) will be awarded to the lowest, responsive and responsible Bidder(s) that has prepared acceptable required submittals, in the opinion of **Department,** as stipulated in Article 5 of this Section.

To the extent permitted by applicable Law, **Department** reserves the right to reject any and all Bids, to waive any and all informalities or irregularities, to disregard all nonconforming, nonresponsive, or conditional Bids, or to re-advertise for Bids.

In order to be considered responsive, a Bid shall be completed, signed and be responsive in all respects to the Bidding Documents unless informalities are waived by **Department**.

In order to be considered responsible, a Bidder must establish to the complete satisfaction of **Department** and **Engineer**, as a minimum, that it has adequate and satisfactory experience and financial resources to meet the obligations under the Contract and award of the Contract would be in the best interest of the State. A Bidder's prior experience shall be considered satisfactory when among other factors, its performance of prior work was timely, of good quality, in compliance with any contract requirements including contracted costs and schedule, and in compliance with applicable Law. The Bidder must have a minimum of three (3) years satisfactory experience in construction of the work to be performed.

Department may conduct such investigations as it deems necessary to assist in the evaluation of any Bid and to establish the responsibility in terms of satisfactory experience and financial ability of the Bidder, and of any proposed subcontractors. **Department** may reject the Bid of any Bidder which it deems not to be responsible and may reject performance of Work by any Subcontractor which it deems is not responsible.

It is the intention of **Department** that the work will be awarded within 14 calendar days after the opening of bids to the lowest responsive, responsible Bidder whose bid conforms to the requirements of the Contract Documents. Bids may not be withdrawn, altered or revoked during this 14 day period except as provided by law and specified within Article 4. Even after the expiration of such 14 day period, **Department** may accept a Bid and award the work to any Bidder whose bid has not been unequivocally withdrawn or revoked prior to the mailing of written Notice of the Award to the successful Bidder. For purposes of the preceding sentence, withdrawal or revocation of a Bid shall not occur until **Department** receives an unequivocable written statement to that effect.

ARTICLE 18 - Time is of the Essence

Time is of the essence for the performance of Work required by the Contract Documents.

ARTICLE 19 - Applicability of Federal, State and Local Law

Any Bid and any Purchase Order awarded pursuant to a Bid shall be subject to and governed by applicable Law.

It is the responsibility of each Bidder to be informed of and comply with Federal, State and local Laws, affecting the cost, schedule, progress, performance or furnishing of the Work. This requirement includes, but is not limited to, applicable regulations concerning minimum wages, nondiscrimination in employment, affirmative action, protection of public and employee safety and health, environmental protection, fire protection and permits, and fees and licensing.

ARTICLE 20 - M/WBE and EEO Requirements

The M/WBE and EEO provisions of Appendix B are required provisions for this contract. The Bidder is required to comply with State regulations 9NYCRR Part 543 entitled, "Requirements and Procedures Regarding Business Participation Opportunities for Minorities and Women on State Contracts."

The selected Bidder shall be required to make good-faith efforts to subcontract at least the percentage stipulated in Section VII Appendix B, of the contract price to NYS Certified Minority Business Enterprise(s) (MBE) and Women Business Enterprise(s) (WBE), respectively.

In accordance with Executive Law Article 15-A, **Department** is required to make available the NYS Directory of Certified Minority and Women Owned Business Enterprises. Empire State Development has put the Minority and Women's Business Development Directory on the Internet at **www.empire.state.ny.us.** Support will be available from 9:00 a.m. to 5:00 p.m., Monday through Friday, except for NYS holidays. If assistance is needed call (518) 474-1979. For additional information and assistance regarding NYS Certified M/WBE's, please contact the Department's Minority and Women's Business Programs Unit at (518) 402-9311.

Pursuant to New York State Executive Law Article 15-A and the attending rules and regulations, an approvable M/WBE and EEO Workplan shall be required within two weeks of the award of a Purchase Order. The workplan is requested to state the M/WBE and EEO goals, the areas of work to be considered for solicitation of M/WBE firms, and a listing of M/WBE firms to be used to supply identified subcontracting work/supplies. A Contractor Detailed EEO and M/WBE Workplan form is included and shall be incorporated into the contract.

Contractor shall be required to provide equal opportunities to minorities and women with regard to all jobs necessary for the performance of work or contracts required by the project. In doing so, **Contractor** agrees to make good-faith efforts to employ minorities and women for at least the percentage stipulated in Section VII Appendix B, of the work force hours required for the completion of the project. Different occupational category work force participation goals may be used to meet these overall goals for work force participation. **Contractor** shall not discriminate against employees or applicants for employment because of race, creed, color, national origin, sex, age, disability, or marital status, and shall undertake or continue existing programs of affirmative action to ensure that minority group persons and women are afforded equal opportunity without discrimination. Such programs shall include, but not be limited to, recruitment, employment, job assignment, promotion, upgrading, demotion, transfer, layoff, termination, rates of pay or other forms of compensation, and selection for training or retraining, including apprenticeship and on-the-job training.

As required by **Department**, **Contractor** shall request of each employment agency, labor union, or authorized representative of workers with which it has a collective bargaining or other agreement or understanding and which is involved in the performance of the Purchase Order with the Agency to furnish a written statement that such employment agency, labor union, or representative shall not discriminate because of race, creed, color, national origin, sex, age, disability, or marital status, and that such union or representative will cooperate in the implementation of **Contractor's** obligations hereunder.

Contractor shall include the provisions of Appendix B (VII) in every subcontract or purchase order in such a manner that the subcontractor shall be required to comply with such provisions with respect to its work in conjunction with the contract with **Department**.

ARTICLE 21 - Permissible Contacts During a Procurement and Prohibition of Inappropriate Lobbying Influence

Chapter 1 of the Laws of 2005, as amended by Chapter 596 of the Laws of 2005 (collectively referred to as the ALobbying Law@), makes major changes to the Legislative Law and State Finance Law relative to lobbying on government procurements. More specifically, the Lobbying Law creates two new sections in the State Finance Law: Section 139-j addresses restrictions on Acontacts@ during the procurement process; and Section 139-k addresses the disclosure of contacts and the responsibility of offerers[1] during the procurement process. The Lobbying Law applies to all procurements initiated on or after January 1, 2006. In this regard, a procurement means a contract or agreement involving an annual expenditure in excess of $15,000 for a commodity, service, technology, public work, or construction; purchase, sale or lease of real property; or revenue contract.

[1] Individual or entity, or any employee, agent, consultant or person acting on behalf of such individual or entity, that contacts the Department about a procurement during the restricted period.

In conformity with the Lobbying Law, during a procurement's restricted period[2] the only New York State Department of Environmental Conservation (Department) officer(s) or employee(s) that the offerer may Acontact@ is/are the Department designated contact person(s) for that procurement. In this regard, Acontact@ means any oral, written, or electronic communication under circumstances where a reasonable person would infer that the communication was intended to influence a procurement. Exceptions to this rule include:

- submission of a written proposal in response to an RFP, IFB or any other solicitation method;
- submission of written questions as part of an RFP, IFB or other solicitation method where all written questions and written responses will be provided to all offerers;
- participation in a pre-proposal or pre-bid conference scheduled as part of an RFP, IFB or other solicitation process;
- written complaints by an offerer that the Department designated contact for a procurement fails to respond to in a timely manner;
- negotiations with the Department following tentative award;
- contacts between designated Department staff and offerer to request the review of a contract award; and
- communications with the Department regarding an appeal, protest or other review of a procurement, participation in an administrative or judicial proceeding regarding a procurement, and complaints regarding a procurement made to the Attorney General, Inspector General, District Attorney, or State Comptroller.

An offerer shall not, under any circumstances, attempt to influence a Department procurement in a way that violates or attempts to violate: Public Officers Law Section 73(5), relating to gifts intended to influence; or Public Officers Law Section 74, relating to the code of ethics for employees of state agencies, public authorities and public benefit corporations, members of the New York State Legislature, and Legislative employees.

An offerer who contacts the Department designated contact person for a procurement during the restricted period must be prepared to provide the following information: name, address, telephone number, place of principal employment and occupation of the person or organization making the contact, and whether the person/organization making the contact is the offerer or is retained, employed or designated by or on behalf of the offerer to appear before or contact the Department about the procurement.

An offerer that submits a proposal, bid or other response to a Department RFP, IFB or other solicitation method must: certify that it understands and agrees to comply with these guidelines regarding permissible contacts during a procurement and the prohibition of inappropriate lobbying influence; and disclose whether any governmental entity has, within the prior four years, found the offerer non-responsible due to a violation of the Lobbying Law or the intentional provision of false or incomplete information. Further, all Department procurement contracts will contain: a certification by the offerer that all information provided to the Department with respect to the Lobbying Law is complete, true and accurate; and a provision authorizing the Department to terminate the contract in the event such information is found to be intentionally false or incomplete.

The Department will investigate all allegations of violations of the Department guidelines regarding permissible contacts during a procurement and the prohibition of inappropriate lobbying influence. A finding that an offerer has knowingly and willfully committed such a violation may result in a determination that the offerer and its subsidiaries are non-responsible and therefore ineligible for award of the procurement contract. A second determination of non-responsibility for such a violation within four (4) years of the first such determination may render the offerer and its subsidiaries ineligible to submit a bid or proposal or be awarded a procurement contract for four (4) years from the date of the second determination. The

[2] The period of time commencing with the earliest public notice, advertisement or solicitation of a Request for Proposals (RFP), Invitation for Bids (IFB), solicitation of proposals or any other method for soliciting responses from offerers intending to result in a procurement contract

by the Department, and ending with the final contract award and approval by the Department, and the Office of the State Comptroller (if required).

Department will notify the New York State Office of General Services (OGS) of any determination of non-responsibility or debarments due to violations of the Lobbying Law.

If you require further guidance on the new Lobbying Law, you are encouraged to visit the Advisory Council on Procurement Lobbying website at the following address:

http://www.ogs.state.ny.us/aboutOgs/regulations/defaultAdvisoryCouncil.html, where Frequently Asked Questions (FAQs) and answers adopted by the council have been posted. A copy of the new Procurement Lobbying Law is also available on this website.

SECTION IV

Supplementary Bidding Information and Requirements

ARTICLE 1 - Location and Description of Project

The Project is located in Towns of Newburgh and New Windsor, in Orange County, New York at the City of Newburgh Washington Lake Filtration Plant (Site) that is owned and operated by the City of Newburgh.

This Project includes: The construction of a GAC treatment system for water supply purposes as generally described in Paragraph 1.2 of Section XI – Specification 01 12 13.

The project will be bid as four prime contracts that include:

Contract No. 010308 – General Construction
Contract No. 010309 – HVAC Construction
Contract No. 010310 – Electric Construction
Contract No. 010326 – Plumbing Construction

ARTICLE 2 - Department Representatives

NAME **ADDRESS**

Gerard W. Burke, Section Chief, Rem. Bur. E, **625 Broadway, 12 Fl., Albany, NY 12233-7017**

Benjamin Rung, Project Manager, Rem. Bur. E, **625 Broadway, 12 Fl., Albany, NY 12233-7017**

To Be Determined, Project Field Representative, **Rem. Bur. E, 625 Broadway, 12 Fl., Albany, NY 12233-7017**

ARTICLE 3 - Pre-Bid Conference

A pre-Bid conference will be held on **Tuesday November 1, 2016, at City Hall, 83 Broadway, Newburgh, NY 12550, starting at 11:00 A.M. prevailing local time (EST).** A site visit will follow immediately to the Pre-Bid Conference to view the Project area. **Parking is limited at the City of Newburgh Washington Lake Filtration Plant and carpooling is encouraged. Active construction is ongoing at the City of Newburgh Washington Lake Filtration Plant and any persons attending the site visit will be required to have personal protective equipment consisting of reflective safety vests, hard hats, steel toed boots and safety glasses.** The pre-bid conference is held to discuss the requirements of the Bidding Documents, the protocols for performing the work and the conditions existing at the work site, and to provide for visual inspection of the Site by Bidders. Bidders will be required to sign an attendance sheet to document their presence at the mandatory pre-bid conference. **Department will accept Bids only from those bidders who attend this conference.**

ARTICLE 4 - Additional Bid Submittals

None

ARTICLE 5 - Other Available Documents

Please refer to the Limited Site Data Document for this project.

ARTICLE 6 - Subcontracting

The maximum subcontracting allowed for this contract is **40 percent** unless a higher percentage is approved by **Department** in writing.

ARTICLE 7 - Type of Schedule

Contractor shall provide a critical path type of schedule as described in Section XI, Specification 01 32 16 - Progress Schedule.

ARTICLE 8 - Wage Rates

The Department requires, for the work under this contract, that the Contractor and its subcontractor pay at least the prevailing wage rate and pay or provide the prevailing supplements, including premium rates for overtime pay, as issued by the State Labor Department. The current wage rates are included within the contract documents, Section XIII.

The Contractor is responsible for any additional costs related to new determinations of the wage rates. The annual determination of the prevailing rates of wages and supplements are usually published on May 31st of each year and are in effect July 1st through June 20th. New determinations will supersede the original schedule or any prior issued annual determination. Any rate change from a previously issued determination becomes effective July 1st, regardless of whether the new determination has been received by the Contractor.

Every contractor and subcontractor shall submit to the Engineer within thirty days after issuance of its first payroll, and every thirty days thereafter, a transcript of the original payroll records, subscribed and affirmed as true under penalty of perjury, as provided by Article 8, Section 220, of the NYS Labor Law. The Engineer shall receive and maintain such payroll records. The original payrolls and transcripts must be preserved for three years from the date of completion of the project. The current prevailing wage rate schedule must be posted in a prominent and accessible place on the site of the public work project.

SECTION V

ARTICLE 1(a) - Contract Bid Form and Acknowledgment for:

GAC Building at Washington Lake Filtration Plant

Plumbing Construction

Contract Number: D010326, NYS Site Number: 336089

To The New York State Department of Environmental Conservation

The Bidder hereby declares that either personally or through authorized representative(s), Bidder has carefully examined all Bidding Documents and has personally or through authorized representative(s) inspected the actual location of the work, together with the local sources of supply; and understands all terms and conditions of Bidding Documents. Bidder further understands that in signing this Bid, the right to plead any misunderstanding regarding the same is waived.

Pursuant to and in compliance with the Bidding Documents, the Bidder hereby offers to furnish all labor, materials, supplies, equipment and other facilities and things necessary or proper for, or incidental to the construction and completion of this Contract, as required by and in strict compliance with the applicable provisions of all Contract Documents, for the following unit and/or lump sum prices.

The undersigned shall meet the required submittal time periods listed in Article 5 - Required Bid Submittals of the Bidding Information and Requirements, Section III.

The undersigned hereby designates the following office as the office to which such Notice of Intent to Award and Notice of Award may be mailed, telegraphed or delivered:

Attn:-_____
Company_____
Address 1_____
Address 2_____
City, State, Zip Code+4_____
Fax Number ( )_____ - _____

E-mail Address_____

Bid

New York State Department of Environmental Conservation

Project Number: D010326, NYS Site Number: 336089

Payment Item Number	***Description***	***Unit***	***Estimated Quantity***	***Unit Price***		***Total Amount ($)***
				Words	***Figures***	
Lump Sum Items						
LS-1	GAC Treatment Building Plumbing Systems	Lump Sum	1			
Payment Item Number	***Description***	***Unit***	***Estimated Quantity***	***Unit Price***		***Total Amount ($)***
				Words	***Figures***	
Unit Price Items						
UP-1	Bedrock Excavation and Disposal	Cubic Yards	50			
UP-2	Select Granular Fill Backfill	Cubic Yards	50			

GRAND TOTAL OF BID _____ $_____

Words Figures

The undersigned acknowledges the receipt of the following Addenda and agrees to be bound by all Addenda whether or not listed herein.

Addendum Number	***Date of Addendum***
_____	_____
_____	_____
_____	_____
_____	_____

Accompanying this proposal is bid security in the amount of $_____; said security is in the form of $_____ certified check or checks, and $_____ Bid Bond which shall become the property of the **Department** if this proposal shall be accepted by **Department**, and the undersigned shall fail to execute and return the contract in a timely manner or fail to comply with the requirements of the Bidding Documents.

_____

Corporate Seal
(If no seal, write "No Seal" and sign)

Legal Name of Person, Partnership or Corporation

By _____

Print Name

_____

Signature

Date _____

Please Complete Information Requested Below:

The P.O. address of the bidder is: _____

Federal Identification Number is: _____

If a Corporation

Name	***Address***
_____, President	_____
_____, Secretary	_____
_____, Treasurer	_____

If a Partnership

Name	***Address***
_____, President	_____
_____, Secretary	_____
_____, Treasurer	_____

(ACKNOWLEDGMENT)

State of _____)
s.s.:
County of _____)

On the _____day of _____in the year _____, before me, the undersigned notary public, personally appeared _____, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose names(s) is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public

Contract Number: D010326

Bidder's/Proposer's Certification (Page 1 of 2)

Non-Collusive Bidding and Nondiscrimination in Employment in Northern Ireland
MacBride Fair Employment Principles

BY SUBMISSION OF THIS BID AND BY SIGNING HEREUNDER THE BIDDER/PROPOSER, AND EACH PERSON SIGNING ON BEHALF OF SUCH PARTY CERTIFIES, AND IN THE CASE OF A JOINT BID/PROPOSAL, EACH PARTY THERETO CERTIFIES AS TO ITS OWN ORGANIZATION, UNDER PENALTY OF PERJURY, THAT TO THE BEST OF HIS/HER KNOWLEDGE AND BELIEF:

Article 1(b) - Non Collusion, State Finance Law §139-d

1) 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 other Bidder or with any competitor;

2) 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

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

Article 1(c) - MacBride Fair Employment Principles, State Finance Law §165(5)

1) it or any individual or legal entity in which the Bidder/Proposer holds a 10% or greater ownership interest, or any individual or legal entity that holds a 10% or greater ownership in the Bidder/Proposer, either: (answer yes or no to one or both of the following, as applicable).

2) Has business operations in Northern Ireland:

   Yes ☐ or No ☐ (check answer) If yes, complete #3

3) Shall take lawful steps in good faith to conduct any business operations that it has in Northern Ireland in accordance with the MacBride Fair Employment Principles relating to non-discrimination in employment and freedom of workplace opportunity, regarding such operations in Northern Ireland and shall permit independent monitoring of its compliance with such Principles. (Check Answer):

   Yes ☐ or No ☐ (check answer)

   NOTE: All references to "bid" "bidder" shall be deemed to include "proposer" "proposal"

Date	**Print Name and Title**
	Signature

Bidder's/Proposer's Certification (Page 2 of 2)

Offerer's Affirmation of Understanding of and Agreement Pursuant to State Ethics Law Provision and State Finance Law §139-j (3) and §139-j (6) (b)

BY SUBMISSION OF THIS BID AND BY SIGNING HEREUNDER THE BIDDER/PROPOSER, AND EACH PERSON SIGNING ON BEHALF OF SUCH PARTY CERTIFIES, AND IN THE CASE OF A JOINT BID/PROPOSAL, EACH PARTY THERETO CERTIFIES AS TO ITS OWN ORGANIZATION, UNDER PENALTY OF PERJURY, THAT TO THE BEST OF HIS/HER KNOWLEDGE AND BELIEF:

Article 1(d) - State Ethics Law Provision

By submittal of this bid, the undersigned hereby certifies, for and on behalf of the bidder, that he is familiar with the following provisions of the State Ethics Law provisions applicable to post employment restrictions affecting former state employees: POL §73(8)(a)(i) the two year ban, and §73(8)(a)(ii), the life time bar, and that submittal of this bid is not in violation of either provision, and that no violation will occur by entering into a contract or in performance of the contractual services, and further that the bidder recognizes that the Department may rely upon this certification.

Except as follows: (attach information if needed)

(Proposer is to make full disclosure of any circumstances which could affect its ability to perform in complete compliance with the cited laws. Any questions as to the applicability of these provisions should be addressed to the New York State Ethics Commission, 39 Columbia Street, Albany, NY 12207:telephone #1-800-87-ETHICS.)

Article 1(e) - Permissible Contacts During a Procurement and Prohibition of Inappropriate Lobbying Influence, State Finance Law §139-j and §139-k

Offerer affirms that it understands and agrees to comply with the procedures of the New York State Department of Environmental Conservation relative to permissible contacts as required by State Finance Law §139-j (3) and §139-j (6) (b).

Use of Best Available Retrofit Technology (BART) and Ultra Low Sulphur Diesel (ULSD) Pursuant to Environmental Conservation Law Section 19-0323

Article 1(f) - Use of Best Available Retrofit Technology (BART) and Ultra Low Sulphur Diesel (ULSD) Provision

The Contractor certifies and warrants that all heavy duty vehicles, as defined in New York State Environmental Law (ECL) section 19-0323, to be used under this Contract, will comply with the specifications and provisions of ECL section 19-0323 and any regulations promulgated pursuant thereto, which requires the use of Best Available Retrofit Technology (BART) and Ultra Low Sulphur Diesel (ULSD), unless specifically waived by the Department. Qualification for a waiver under this law will be the responsibility of the Contractor.

NOTE: All references to "bid" "bidder" shall be deemed to include "proposer" "proposal."

Date	**Print Name and Title**
	Signature

Bid Security

If Bid Security is a Bid Bond, use Bid Bond form and provide certified power of attorney.

ARTICLE 1(h) - Bid Bond

Know all men by these presents, that we, the undersigned, _____, as Principal, and _____, as Surety, are hereby held and firmly bound unto New York State Department of Environmental Conservation in the penal sum of _____ for the payment of which, will and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns. Signed this _____ day of _____, 20_____.

The condition of the above obligation is such that whereas the Principal has submitted to New York State Department of Environmental Conservation certain Bid, attached hereto and hereby made a part hereof to enter into a contract in writing, for the

_____
_____
_____

Now, Therefore

a) If said Bid shall be rejected, or in the alternate,

b) If said Bid shall be accepted and the principal shall execute and deliver a contract in the Form of Contract attached hereto (properly completed in accordance with said Bid) and shall furnish a bond for the faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said Bid.

Then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligation of said Surety and its bond shall be in no way impaired or affected by any extension of the time within which the Owner may accept such Bids; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

(Seal)

_____
Principal

_____
Surety

By _____

(ACKNOWLEDGMENT BY SURETY COMPANY)

State of _____)
County of _____) s.s.:

On this _____ day of _____, 20_____ before me personally came _____ to me known, who being by me duly sworn, did depose and say that he/she resides in _____, that he/she is the _____ ***(title)*** of the _____***(firm)***, the corporation described in and which executed the within instrument; that he/she knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that it was so affixed by the order of the Board of Directors of said corporation and the he/she 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.

(Seal)

_____
Notary Public

(**ACKNOWLEDGMENT)**

State of _____)
s.s.:
County of _____)

On the _____day of _____in the year _____, before me, the undersigned notary public, personally appeared _____, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose names(s) is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public

ARTICLE 1(i) - Offerer Disclosure of Prior Non-Responsibility Determinations
(Page 1 of 2)

Name of Individual or Entity Seeking to Enter into the Procurement Contract:

_____

Address:_____

_____

Name and Title of Person Submitting this Form:_____

_____

Contract Procurement Number: D010326

Date:_____

1. Has any Governmental Entity made a finding of non-responsibility regarding the individual or entity seeking to enter into the Procurement Contract in the previous four years? (Please circle):

Yes ☐ No ☐

If yes, please answer the questions 2 - 4, if no, go to question 5:

2. Was the basis for the finding of non-responsibility due to a violation of State Finance Law §139-j? (Please circle):

Yes ☐ No ☐

3. Was the basis for the finding of non-responsibility due to the intentional provision of false or incomplete information to a Governmental Entity? (Please circle):

Yes ☐ No ☐

4. If you answered yes to any of the above questions, please provide details regarding the finding of non-responsibility below.

Governmental Entity: _____

Date of Finding of Non-responsibility: _____

Basis of Finding of Non-Responsibility: _____

_____
_____
_____
_____

(Add additional pages as necessary)

5. Has any Governmental Entity or other governmental agency terminated or withheld a Procurement Contract with the above-named individual or entity due to the intentional provision of false or incomplete information? (Please circle):

Yes ☐ No ☐

6. If yes, please provide details below.

Governmental Entity: _____

Date of Termination or Withholding of Contract:_____

Basis of Termination or Withholding: _____

_____

_____

_____

_____

(Add additional pages as necessary)

Offerer Certification:

Offerer certifies that all information provided to the New York State Department of Environmental Conservation with respect to State Finance Law §139-k is complete, true and accurate.

By:_____ Date: _____
Signature

ARTICLE 2(a) - Corporate Resolution and Certification

"This Article 2(a) is not applicable"

ARTICLE 2(b) - Statement of Surety's Intent

To: ***New York State Department of Environmental Conservation***

We have reviewed the Bid of _____ (Contractor)

of _____ (Address)

for _____ (Project)

Contract Number: D010309

NYS Site Number: 336089

Bids for which will be received on _____ (insert Bid Opening Date) and wish to advise that should this Bid of Contractor be accepted and the Contract awarded to Contractor, it is our present intention to become surety on the Performance Bond and Labor and Material Payment Bond required by the Contract.

Any arrangement for the Bonds required by the Contract is a matter between Contractor and ourselves and we assume no liability to Department or third parties if for any reason we do not execute the requisite bonds.

We are duly licensed to do business in the State of New York.

Attest:

Corporate Seal
(If no seal, write "No Seal" and sign)

_____
Surety's Authorized Signature(s)

_____
Telephone Number for Bonding Company

_____
Telephone Number for Bonding Broker

Attach Power of Attorney

Article 2(c) - M/WBE-EEO Workplan and Utilization Plan

Contractor must submit a M/WBE Workplan after being announced the apparent low bidder in accordance with Section III, Article 5.b. Contractor must submit M/WBE-EEO Utilization Plan after being issued Notice of Intent to Award in accordance with Section III, Article 5.c. Quarterly reporting is required throughout the term of the contract.

Contractors are invited to file the required forms online or may choose to complete and submit paper forms. Instructions are available at: http://www.dec.ny.gov/about/48854.html

If submitting paper forms, The M/WBE-EEO Utilization Plan and/or quarterly reports shall be sent directly to:

NYS Department of Environmental Conservation
Division of Management and Budget Services
Minority and Women's Business Programs Unit, l0th Floor
625 Broadway
Albany, New York 12233-5028

Contractors opting to file electronic forms can obtain the appropriate forms from the website and certify to the Department, via a letter, within the timeframes designated in the Instructions to Bidders, that the forms have been completed and submitted. The Contractor will be able to supply any additional information requested by the Department, by updating the online forms and notifying the Department via letter, that it has been re-submitted.

M/WBE Directory on the Internet

Empire State Development has put the Minority and Women-Owned Business Directory on the Internet. The Internet address is www.empire.state.ny.us, just follow the links to the M/WBE Directory. Support will be available from 9:00 a.m. to 5:00 p.m., Monday through Friday, except for NYS holidays. If assistance is needed, call (518) 474-1979.

Article 2 (d) - Instructions for Completing the New York State Vendor Responsibility Questionnaire CCA-2

*Please Read Before Completing Questionnaire

Contractors must submit a Vendor Responsibility Questionnaire CCA-2 form after being announced the low bidder for any competitively bid contract of $10,000 or more, or when proposed for subcontract work valued at $10,000 or more. The Department may require additional information deemed necessary for its review.

Contractors are invited to file the required Vendor Responsibility Questionnaire online via the New York State VendRep System or may choose to complete and submit a paper questionnaire. To enroll in and use the New York State VendRep System, see the VendRep System Instructions available at http://www.osc.state.ny.us/vendrep/systeminit.htm or go directly to the VendRep System online at https://portal.osc.state.ny.us. For direct VendRep System user assistance, the Office of the State Comptroller's Help Desk may be reached at 866-370-4672 or 518-408-4672 or by email at helpdesk@osc.state.ny.us. Contractors opting to file a paper questionnaire can obtain the appropriate questionnaire from the VendRep website www.osc.state.ny.us/vendrep or contact the Office of the State Comptroller's Help Desk.

The enrollment process in the VendRep System can take several days. Contractors are encouraged to enroll prior to submitting bids to ensure meeting the timeframes for certification.

Contractors electing to file the Vendor Responsibility Questionnaire online shall certify to the Department, via a letter, within the timeframe designated in the Instructions to Bidders, that the questionnaire has been updated. The Contractor will be able to supply any additional information requested by the Department, by updating the online questionnaire and notifying the Department via letter, that it has been recertified.

Throughout the contract term, the Contractor is required to notify the Department in writing of any changes in Contractor's vendor responsibility disclosure related to the Contractor commencing bankruptcy proceedings; filings against the Contractor for relief under bankruptcy; Contractor making general assessment for benefit of creditors; a Court appointing a party to take charge of the Contractor's property; Contractor's inability to pay debts; or the Contractor being found in violation of laws and regulations of any public body having jurisdiction.

If the Contractor elects to file a paper copy directly with the Department, a completed original CCA-2 Form must be submitted within the timeframe designated in the Instructions to Bidders. Submit completed questionnaires marked "CONFIDENTIAL" to:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Benjamin Rung, Project Manager
625 BROADWAY12th FLOOR
ALBANY, NY 12233-7017
(518)402-9814

ARTICLE 3(a) - Instructions for Certificate of Insurance

Use this form to certify insurance coverage and provide policy information.

Contractor must fill out Section 1 in its entirety before sending to the insurance agent.

Contractor is encouraged to send a copy of Section VIII, "General Conditions," Article 4, along with the Certificate of Insurance Form to its insurance agent in order that all required coverages and provisions are accounted for.

Insurance Agency

1) Complete Section 2 of the form.

2) Enter N/A if No Excess Umbrella (9) policy is in effect.

3) All insurance certificates must have a policy number entered otherwise it will result in rejection of the certificate.

4) Certificates must be signed by an authorized representative of the firm.

5) Specify policy if Other (10) is in effect, otherwise enter N/A.

Contractor

1) Complete Section 1 of the form.

2) At the top of the form, check "New" if you are submitting proof of coverage for a new contract. Check "Renewal" if you are submitting proof of renewals.

3) Submit original certificate and subsequent renewals to Division of Environmental Remediation, New York State Department of Environmental Conservation, 12th Floor, New York State Department of Environmental Conservation, 625 Broadway, Albany, New York 12233-7017 , **Attention:** "**Benjamin Rung, P.E., Project Manager**." (Also see Section IV, Article 2 for name of project manager).

ARTICLE 3(b) **Certificate of Insurance**

New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau E, 12th Floor
625 Broadway, Albany, NY 12233-7017

NYSDEC-DER Site 336089
Contract No D010326
Certificate of Insurance
☐New ☐Renewal

SECTION 1

Name and Address of Insured Contractor
(for Coverages 1,2,3,4,6,7,8,9,10)

_____
_____
_____

Name of Insured or Additional Insured (for Coverage 5,6,7 & 10)
State of New York & NYS Dept. of Environmental Conservation

Location and Description of Work: City of Newburgh Washington Lake Filtration Plant, Site No. 336089

SECTION 2

This is to certify that policies of insurance listed below have been issued to the contractor, named above, and are in force at this time.

Insurance	*Policy #*	*Name of Company Affording Coverage*	*Expir. Date*	*Limits of Liability (in thousands)*	
				Each Occurrence	*Aggregate*
1. Contractor's Liability					
2. Contractor's Protective Liability					
3. Complete Operations/Products					
4. Contractual Liability					
5. Owner's Protective Liability					
6. Automobile Liability					
7. Pollution Liability					
8. Worker's Comp. Disability Benefits				Limits as required by Law Limits as required by Law	
9. Excess Umbrella					
10. Other					

Such insurance as is herein certified: 1) applies to all operations of said insured in connection with the work required by the provisions of the documents forming this contract, 2) applies whether or not the contract documents between the insured contractor and the State of New York Department of Environmental Conservation have been executed, and 3) is written in accordance with the company's regular policies and endorsements, subject to the company's applicable manuals or rules and rates in effect as modified by this certificate and the insurance article of the contract.

No policy referred to herein shall be changed, cancelled or coverage terminated for any reason including expiration of the policy or non-payment of premiums until thirty (30) days written notice has been received by the Division of Environmental Remediation, Remedial Bureau E, NYS Dept. of Environmental Conservation, 12th floor, 625 Broadway, Albany, NY 12233-7017. Such notice shall be mailed via certified or registered mail.

_____ By _____
(Date Issued) (Signature of Authorized Representative)

_____
(Print Insurance Agency Name)

Policy coverages must agree with coverages stated on the Certificate. False statements of coverage are punishable under Section 117 of the New York State Insurance Law.

ARTICLE 3(c) - Instruction for Performance Bond and Labor and Material Payment Bond

1) The performance bond and the labor and material payment bond are to be only submitted by the bidder who receives the Notice of Intent to Award letter from **Department**.

2) Use the forms that are included in the Contract Documents. **DO NOT RETYPE THE FORMS.**

3) Attach a **SEPARATE** certified power of attorney and surety financial statement to **EACH** bond (i.e., one set attached to performance bond and one set attached to labor and material payment bond).

ARTICLE 3(d) - ***Performance Bond***

Date Bond Executed _____ **NYSDEC-DER Site Number**: **336089**

Date Contract Executed By Principal _____

Principal (Name and Address)

_____
_____
_____
_____

Surety (Name and Address - Indicate State of incorporation and location of principal office)

_____
_____
_____
_____

Full and Just Sum of Bond (Express in words) _____

(Express in figures) _____

Know all men by these presents, That we, the **Principal** and **Surety**, above named, are held and firmly bound unto the Department of Environmental Conservation for and on behalf of the People of the State of New York, hereinafter called the Department, in full and just sum of the amount stated above, good and lawful money of the United States of America, to the payment of which said sum, well and truly to be made, we bind ourselves, our heirs, executors and administrators, successors and assigns, jointly and severally, firmly by these presents.

Whereas, the **Principal** has entered into a certain written contract with the Department, covering the project and specification above;

Now, Therefore, the condition of this obligation is such, that if the **Principal** shall well, truly and faithfully comply with and perform all of the terms, covenants and conditions of said contract on their (his, its) part to be kept and performed, according to the true intent and meaning of said contract, and shall protect the Department and the People of the State of New York against, and pay any and all amounts, damages, costs and judgments which may or shall be recovered against the Department or the State of New York may be called upon to pay to any person or corporation by reason of any damages arising or growing out of the doing of said work, or the repair or maintenance thereof, or the manner of doing the same, or the neglect of the **Principal**, or their (its) agents or servants, or the improper performance of the work by the **Principal**, or their (its) agents or servants, or the infringement of any patent or patent rights by reason of the use of materials furnished or work done as aforesaid or otherwise, then this obligation shall be null and void, otherwise to remain in full force and virtue.

And the **Surety**, for value received, hereby stipulates and agrees, if requested to do so by the department to fully perform and complete the work mentioned and described in the contract and specifications, pursuant to the terms, conditions and covenants thereof, if for any cause, the **Principal** fails or neglects to so fully perform and complete the work; and the **Surety** further agrees to commence the work of completion within twenty days after notice thereof from the Department, and to complete the work with all due diligence.

And the **Surety**, for value received hereby stipulates and agrees that no change, extension, alteration or addition to the terms of this contract or specifications, accompanying the same, shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension, alteration or addition.

In Testimony Whereof, the **Principal** and the President and Secretary of the **Surety** have caused this instrument to be signed and sealed on the date shown above.

Signed, sealed and delivered in the presence of _____

Name of Corporation

Corporate Seal of Principal
if a Corporation

By _____

Print Name _____

_____L.S.

Signature

Date _____

Corporate Seal of Surety Company

_____

Corporation Surety

_____

Business Address

By (President)_____

Attest (Secretary)

_____ _**Date** _____

(ACKNOWLEDGMENT BY SURETY COMPANY)

State of)
County of) s.s.:

On this _____ day of _____, 20_____ before me personally came _____ to me known, who being by me duly sworn, did depose and say that he/she resides in_____, that he/she is the _____ ***(title)*** of the _____ ***(firm)***, the corporation described in and which executed the within instrument; that he/she knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that it was so affixed by the order of the Board of Directors of said corporation and the he/she 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.

(Seal)

_____

Notary Public

(ACKNOWLEDGMENT)

State of)
County of) s.s.:

On the _____day of _____in the year _____, before me, the undersigned notary public, personally appeared _____, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose names(s) is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____

Notary Public

ARTICLE 3(e) - New York State Department of Environmental Conservation

Labor and Material Payment Bond

Date Bond Executed:_____ **NYSDEC-DER Site Number:** **336089**

Date Contract Executed By Principal _____

Principal (Name and Address) _____

Surety (Name and Address - Indicate State of incorporation and location of principal office)

_____
_____
_____
_____

Full and Just Sum of Bond (Express in words) _____

(Express in figures) _____

Know all men by these presents, That We, the **Principal** and the **Surety** above named, are held and firmly bound unto the Department of Environmental Conservation for and on behalf of the People of the State of New York, in full and just sum of the amount stated above, good and lawful money of the United States of America, to the payment of which said sum, well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

Whereas, the **Principal** has entered into a certain written contract with the Department of Environmental Conservation, covering the project and specification indicated above.

Now, Therefore, the condition of this obligation is such, that if the **Principal** shall promptly pay all moneys due to all persons furnishing labor and materials to him or his subcontractors in the prosecution of the work provided for in the contract, then this obligation shall be void, otherwise to remain in full force and effect;

Provided, however, that the Comptroller of the State of New York having required the **Principal** to furnish this bond in order to comply with the provisions of Section 137 of the State Finance Law, all rights and remedies on this bond shall inure solely to such persons and shall be determined in accordance with the provisions, conditions and limitations of said Section to the same extent as if they were copied at length herein; and

Further, provided, that the place of trial of any action on this bond shall be in the county in which the contract was to be performed, or if the contract was to be performed in more than one county, then in any such county, and not elsewhere.

In Testimony Whereof, the **Principal** and the President and Secretary of the **Surety** have caused this instrument to be signed and sealed on the date shown above.

Signed, sealed and delivered in the presence of _____

Name of Corporation

Corporate Seal of Principal
if a Corporation **By** _____

Print Name

_____L.S.

Signature

Date _____

Corporate Seal of Surety Company

_____
Corporation Surety

_____
Business Address

By (President)_____

Attest (Secretary)_____

Date _____

(ACKNOWLEDGMENT BY SURETY COMPANY)

State of _____)
County of_____) s.s.:

On this _____ day of _____, 20_____ before me personally came _____ to me known, who being by me duly sworn, did depose and say that he/she resides in _____, that he/she is the _____ ***(title)*** of the _____***(firm)***, the corporation described in and which executed the within instrument; that he/she knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that it was so affixed by the order of the Board of Directors of said corporation and the he/she 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.

Seal

_____
Notary Public

(ACKNOWLEDGMENT)

State of_____)
s.s.:
County of _____)

On the _____day of _____in the year _____, before me, the undersigned notary public, personally appeared _____, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose names(s) is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public

SECTION VI

Agreement

This Agreement by and between the **New York State Department of Environmental Conservation**, (hereinafter referred to as Department) having offices at 625 Broadway, Albany, New York 12233 and _____.

___ a corporation organized and existing under the laws of the State of _____

___ a partnership, consisting of

___ an individual conducting business as

the location of whose principal office is _____ hereinafter called "Contractor."

WITNESSETH

Whereas, Department is empowered by law to obtain services; the performance of these services is essential to Department; and Department, after fully examining all of its internal capabilities and thoroughly investigating all possible alternative approaches, has determined that certain tasks can best be accomplished through a contract;

Whereas, Contractor hereby represents that it is capable of providing the services which are the subject matter of this Contract;

***Now Therefore*,** Department **and** Contractor, in consideration of the mutual covenants hereinafter set forth agree as follows:

ARTICLE 1 - Defined Terms

Terms used in the Agreement which are defined in the Contract Documents have the intent and meanings assigned to them in the Contract Documents.

ARTICLE 2 - Work

As indicated or specified in the Contract Documents, Contractor shall complete in a timely and workmanlike manner, any and all obligations, duties and responsibilities, and provide any and all labor, materials, equipment, temporary facilities, and incidentals necessary to complete the construction generally identified and shown on the plans and Contract Documents entitled:

New York State Department of Environmental Conservation
Division of Environmental Remediation
Site Name: Washington Lake Filtration Plant
Project Name: City of Newburgh GAC Treatment System at Washington Lake Filtration Plant
Contract: Plumbing Construction
DEC Contract Number: D010326
Date: October 2016

ARTICLE 3 - Engineer

ARCADIS, CE, Inc. shall assume all duties and responsibilities of and have the rights and authority assigned to Engineer in the Contract Documents in connection with completion of the Work in accordance with the Contract Documents.

ARTICLE 4 - Contract Documents

The Documents which comprise the entire Contract between Department and Contractor concerning the Work consist of the following:

4.0 Appendices A and B
4.1 Engineer's written clarifications and interpretations
4.2 Change Orders
4.3 Administrative Agreements
4.4 Field Orders
4.5 Proposed Change Orders signed by Department
4.6 Approved Shop Drawings
4.7 Addenda
4.8 Agreement
4.9 Measurement for Payment
4.10 Bid Forms and Attachments Exclusive of Bonds and Insurance Certificates
4.11 Drawings, Plans
4.12 Supplementary Specifications
4.13 Supplementary Conditions
4.14 Standard Specifications
4.15 General Conditions
4.16 Supplementary Bidding Information and Requirements
4.17 Bidding Information and Requirements
4.18 Terms and Definitions
4.19 Advertisement
4.20 Bonds and Insurance Certificates

In the event of a conflict between the documents set forth above, they shall be entitled to priority according to the order in which they are listed.

ARTICLE 5 - Contractor's Representations

In order to induce Department to enter into this Agreement, Contractor makes the following representations:

5.1 Contractor has familiarized itself with the nature and extent of the Contract Documents, Work, site, locality, and all local conditions and applicable Laws that in any manner may affect cost, schedule, progress, performance or furnishing of the Work.

5.2 Contractor has studied carefully all reports of explorations and tests of subsurface conditions and drawings of physical conditions which are identified in Information to Bidders, as provided in the General Conditions, and accepts the determination set forth in said Section to the extent of the technical data contained in such reports and drawings upon which Contractor is entitled to reply.

5.3 Contractor has obtained and carefully studied all such examinations, investigations, explorations, tests, reports and studies which pertain to the subsurface or physical conditions at or contiguous to the site or otherwise may affect the cost, schedule, progress, performance or furnishing of the Work as Contractor considers necessary for the performance or furnishing of the Work at the Contract Price, within the Contract Time and in accordance with the other terms and conditions of the Contract Documents, including specifically the provisions of Article 3 of the General Conditions; and no additional examinations, investigations, explorations, tests, reports, studies or similar information or data are or will be required by Contractor for such purposes.

5.4 Contractor has reviewed and checked all information and data shown or indicated on the Contract Documents with respect to existing Underground Facilities. No additional examinations, investigations, explorations, tests, reports, studies or similar information or data in respect of said Underground Facilities are or will be required by Contractor in order to perform and furnish the Work at the Contract Price, within the Contract Time and in accordance with the other terms and conditions of the Contract Documents, including specifically the provisions of Article 3 of the General Conditions.

5.5 Contractor has correlated (or assumes responsibility for correlating) the results of all such observations, examinations, investigations, explorations, tests, reports and studies with the terms and conditions of the Contract Documents.

5.6 Contractor has given Engineer written notice of all conflicts, errors or discrepancies that he (she) has discovered in the Contract Documents and any written resolution thereof is acceptable to Contractor.

5.7 General Responsibility: The Contractor shall at all times during the Contract term remain responsible. The Contractor agrees, if requested by the Commissioner or his or her designee, to present evidence of its continuing legal authority to do business in New York State, integrity, experience, ability, prior performance, and organizational and financial capacity. Additional responsibilities required of the Contractor in order to perform and furnish the Work at the Contract Price, within the Contract Time and in accordance with the other terms and conditions of the Contract Documents, are specified within the provisions of Article 5 of the General Conditions.

ARTICLE 6 - Contract Term

The number of days within which, or alternatively, the dates by which, the Work, or any specified part thereof, is to be completed (the Contract Times) are set forth as follows:

6.1 The Work will be Substantially Completed within **330 calendar days** from the Notice to Proceed, unless required to be completed early by Milestone as described in paragraph 6.3.

6.2 The Work will be completed and ready for final payment in accordance with the General Conditions within **360 calendar days** from the Notice to Proceed.

6.3 Milestones: Parts of the Work will be substantially completed on or before the Milestone(s) indicated below. Requirements for the specific Work to be substantially completed for each Milestone is indicated in Section XI, Specification Section 01 13 13, Milestones.

1) Milestone A: 135 days after March 13, 2017, for receipt of GAC Contactor Systems Nos. 1 through 6.

2) Milestone B: 114 days after April 3, 2017, for receipt of GAC Contactor Systems Nos. 7 through 12.
3) Milestone C: 93 days after April 24, 2017, for receipt of GAC Contactor Systems Nos. 13 through 18.
4) Milestone D: 120 days after May 1, 2017, for receipt and installation of GAC media.
5) Milestone E: On or before September 15, 2017, for partial utilization of GAC Treatment System and New York State Department of Health approval inclusive of GAC Contactor Systems Nos. 1A, 1B, 2A, 2B, 3A, 3B, 4A, 4B, 5A, 5B, 6A and 6B, as shown on the Drawings.

6.4 Department and Contractor recognize that the Contract Time(s) specified in paragraphs 6.1, 6.2 and 6.3 above are of the essence of this Agreement, and that Department may suffer financial loss if the Work is not completed within the Contract Time(s) specified above, plus any extensions thereof allowed in accordance with the General Conditions, as amended or supplemented in the Supplementary Conditions.

6.5 Accordingly, Contractor agrees to forfeit and pay Department as liquidated damages, and not as a penalty, the amount of **Five Thousand dollars ($5,000)** for each day that expires after the Contract Time specified in paragraphs 6.1 and 6.3 above for Substantial Completion until the Work is Substantially Complete. Contractor further agrees to pay Department as liquidated damages, and not as a penalty, each of the amounts set forth in Attachment A if applicable to this agreement for each day that expires after each of the contract times specified in paragraph 6.2 above for substantial completion until the each of the separable parts of the work is substantially complete. After substantial completion of the work, if Contractor shall neglect, refuse or fail to complete the remaining work within the contract time or any proper extension thereof granted by Department, Contractor shall pay Department as liquidated damages, and not as a penalty, the amount of **One Thousand dollars ($1,000)** for each day that expires after the Contract Time specified in paragraph 6.2 above for completion and readiness for payment. These liquidated damages are additive and represent a reasonable estimate, in lieu of any such proof, of Department's extra expenses for Inspection, engineering services, administrative costs, and Interim excess operating costs for each day that expires after the associated Contract Time.

6.6 In addition to the liquidated damage amounts set forth in paragraph 6.5 above, Contractor agrees to pay Department's additional actual damages arising out of the types of expenses itemized below for each day that expires after each of the Contract Times specified in paragraph 6.1 and 6.3 above for Completion of each of the designated parts of the Work until each of the designated parts of the Work achieves the specified completion. These actual damages are additive and shall equal Department's expenditures for costs other than those itemized in paragraph 6.5, including, but not limited to, delay damage settlements or awards related to other separate contracts, delay penalties or fines imposed by regulatory agencies, contract damage and loss of use, excess financing costs, and professional fees and related expenses incurred thereto.

ARTICLE 7 - Alterations and Omissions

Department reserves the right, at any time during the progress of the work, to alter the plans or omit any portion of the work as it may deem reasonably necessary for the public interest; making allowances for additions and deductions with compensation made in accordance with the Contract Documents.

ARTICLE 8 - Determinations as to Variances

In case of any ambiguity in the Contract Documents, the matter must be immediately submitted to the Representative of Department designated in the Contract Documents, who shall adjust the same, and his (her) decision in relation thereto shall be final and conclusive upon the parties.

ARTICLE 9 - Payment Procedures

Contractor shall submit Applications for Payment on standard form in accordance with the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions, as amended or supplemented in the Supplementary Conditions and in accordance with Section 139-f of the State Finance Law.

9.1 **Progress Payments.** Contractor shall submit Applications for Payments to Engineer for review no more frequently than monthly in accordance with paragraph 13.2 of the General Conditions from the date when the Contract Time commences to run. Department shall make progress payments against the Contract Price on the basis of Contractor's Applications for Payment as recommended by Engineer as provided below. All progress payments will be calculated on the basis of the progress of the Work measured by the schedule of values established pursuant to paragraph 1.4.3 of the General Conditions. Progress payments will also be made for materials pertinent to the Contract in accordance with the General Conditions. Contractor shall provide complete and accurate billing invoices to the Department in order to receive payment. Billing invoices submitted to the Department must contain all information and supporting documentation required by the Contract, the Department, and the State Comptroller.

Payments for expenditures incurred under this contract will be rendered electronically to the ***Recipient/Contractor/Vendor*** unless payment by paper check is expressly authorized by the Commissioner of the Department (Commissioner), in the Commissioner's sole discretion, due to extenuating circumstances. Such electronic payment shall be made in accordance with ordinary State procedures and practices. The ***Recipient/Contractor/Vendor*** shall comply with the ***Comptroller's/OSC's*** procedures to authorize electronic payments. Authorization forms are available at the ***Comptroller's/OSC's*** website at www.osc.state.ny.us/epay/index.htm, by e-mail at epunit@osc.state.ny.us or by telephone at (518) 474-4032. The ***Recipient/Contractor/Vendor*** acknowledges that it will not receive payment under this ***Contract/Purchase Order*** if it does not comply with the ***Comptroller's/OSC's*** electronic payment procedures, except where the Commissioner has expressly authorized payment by paper check as set forth above.

9.1.1 Prior to Substantial Completion of the Work, progress payments will be made less five percent (5%) the aggregate of payments (i.e. retainage) previously made and less an amount necessary to satisfy any claims, liens, or judgments against Contractor which have not been suitably discharged.

9.2 **Payment upon substantial completion.** When the work or major portions thereof, as contemplated in the Contract Documents, is substantially completed, Contractor shall submit to Department, an Application for Payment in accordance with the General Conditions for the remaining amount of the contract balance or amount due for that major portion completed. Department will pay the remaining Contract balance, or amount due for that major portion completed, less two times the value of any remaining items to be completed and an amount necessary to satisfy any claims, liens, judgments against Contractor which have not been suitably discharged. Payment for remaining items will be made upon their completion.

9.3 **Final Payment.** Upon final completion of the physical Work and acceptance of the Work in accordance with the General Conditions, Department shall pay the remainder of the Contract Price as recommended by Engineer.

ARTICLE 10 - No Estimate on Contractor's Noncompliance

It is further agreed that so long as Contractor has not complied with any lawful or proper direction concerning the work or material given by Department, Contractor shall not be entitled to have any estimate made for the purpose of payment, nor shall any estimate be rendered on account of work done or material furnished until Contractor has fully and satisfactorily complied with such direction.

ARTICLE 11 - Delays, Inefficiencies, and Interference

Contractor agrees to make no claim for any consequential damages attributable to any delays, or act in the performance of this contract which are not directly occasioned by any act or omission to act by the State or any of its representatives. In the event Contractor completes the work prior to the contract completion date set forth in the proposal, Contractor hereby agrees to make no claim for extra costs due to delays, interferences or inefficiencies in the performance of the work.

1) Contractor further agrees that it has included in its bid prices for the various items of the contract any additional costs for delays, inefficiencies, or interferences affecting the performance or scheduling of contract work caused by, or attributable to, the following instances:

   a) The work or the presence on the Site of any third party, including but not limited to that of other contractors or personnel employed by the State, or by other public bodies, by railroad, transportation or utility companies or corporations, or by private enterprises, or any delay in progressing such work by any third party.

   b) The existence of any facility or appurtenance owned, operated, or maintained by any third party.

   c) The act, or failure to act, of any other public or governmental body, including, but not limited to, approvals, permits, restrictions, regulations or ordinances.

   d) Restraining orders, injunctions, or judgments issued by a court.

   e) Any labor boycott, strike, picketing or similar situation.

   f) Any shortages of supplies or materials required by the contract work.

   g) Any situation which was, or should have been within, the contemplation of the parties at the time of entering into the contract.

ARTICLE 12 - Postponement, Suspension or Termination

12.1 Department shall have the right to postpone, suspend or terminate this Purchase Order in whole or in part for the convenience of Department. If, after termination for cause of Contractor it is determined that no cause existed for termination of Contractor, such termination shall be deemed to have been made for the convenience of Department.

12.2 If this Contract is terminated by Department for convenience or cause, Department shall make payment on an equitable basis for all work performed in accordance with the Contract Documents prior to termination in accordance with paragraphs 12.3 and 12.4 below.

12.3 If this contract is terminated for cause, no payment shall be made for anticipated profit on unperformed work or services. Additionally, Department may adjust any payment due to Contractor at the time of termination to account for any additional costs to Department because of Contractor's default.

12.4 If this contract is terminated for convenience, payment shall be made for any services rendered and expenses incurred prior to the termination, in addition to termination settlement costs reasonably incurred by Contractor which had become firm prior to the termination.

12.5 Upon termination of this Contract under this Agreement, Department may take over the work or may award or negotiate a contract with another party to complete work required by these Contract Documents.

12.6 Termination for Non-Responsibility: Upon written notice to the Contractor, and a reasonable opportunity to be heard with appropriate Department officials or staff, the Contract may be terminated by the Commissioner or his or her designee at the Contractor's expense where the Contractor is determined by the Commissioner or his or her designee to be non-responsible. In such event, the Commissioner or his or her designee may complete the contractual requirements in any manner he or she may deem advisable and pursue available legal or equitable remedies for breach.

12.7 Suspension of Work (for Non-Responsibility): The Commissioner or his or her designee, in his or her sole discretion, reserves the right to suspend any or all activities under this Purchase Order, at any time, when he or she discovers information that calls into question the responsibility of the Contractor. In the event of such suspension, the Contractor will be given written notice outlining the particulars of such suspension. Upon issuance of such notice, the Contractor must comply with the terms of the suspension order. Contract activity may resume at such time as the Commissioner or his or her designee issues a written notice authorizing a resumption of performance under the Contract.

ARTICLE 13 - Completion of Physical Work and Final Acceptance

The time within which Department may bring an action on the Contract against Contractor shall be computed from the date of completion of the physical Work. In accordance with Section 138-a of the State Finance Law, Contractor shall notify Department in writing that the physical Work has been completed. The date of completion must be no more than thirty days prior to the date of the notice. This notice must be delivered personally or by either registered or certified mail, return receipt requested to the exact address given below.

Mr. Gerard W. Burke, Section Chief
NYSDEC - Division of Environmental Remediation
Section A, Remedial Bureau E
625 Broadway, 12th Floor
Albany, New York 12233-7017

If Department disagrees with the date set forth in the notice, it will so advise Contractor in writing within 30 days of receipt of the notice. This notice will be delivered by either registered or certified mail, return receipt requested to Contractor's address as shown in this Agreement.

If Department accepts Contractor's date of completion of physical Work, Department's final acceptance of work shall be as of that date.

When, in the opinion of Department, Contractor has fully performed the physical Work under the Contract, Department shall notify Contractor in writing of final acceptance.

ARTICLE 14 - Final Payment

After the final acceptance of the work, Engineer shall prepare a final agreement of the work performed and the materials placed and shall compute the value of such work and materials under and according to the terms of the contract. This agreement shall be certified, as to its correctness, by Engineer and submitted for final approval to Department. The Representative of Department designated in the Contract Documents shall have the right to reject the whole or any portion of the final agreement, should the said certificate of Engineer be found or known to be inconsistent with the terms of the agreement or otherwise improperly given and upon failure of Contractor to provide requested documentation including but not limited to that regarding payment of wages, suppliers or subcontractors. All certificates upon which partial payments may have been made being merely estimates, shall be subject to correction in the final certificate or final agreement.

ARTICLE 15 - Disposition of Documents and Data

Upon final acceptance of work under this Contract or termination of this Contract pursuant to this Agreement, or upon written demand of Department, Contractor shall promptly deliver or otherwise make available to Department all data, drawings, reports, estimates, and such other information and materials as may have been accumulated by Contractor in performing this Contract.

All documents and data are to be submitted in electronic format to the Engineer and Department. The Engineer/Department will not approve a final report unless, and until, all documents and data generated in support of that report have been submitted in accordance with the electronic submission protocols. Information on the format of data submissions can be found at: http://www.dec.ny.gov/chemical/62440.html . Information on document submissions can be found at: http://www.dec.ny.gov/regulations/2586.html.

ARTICLE 16 - Applicable Law; Jurisdiction; Service of Legal Process

Contractor agrees:

16.1 That this Agreement is subject to and governed by all applicable federal and New York State law.

16.2 To procure all necessary licenses and permits.

16.3 To voluntarily and irrevocably submit to the jurisdiction of a New York State Court of competent jurisdiction, to resolve any dispute or controversy arising out of this Contract.

16.4 That the venue of any action at law or in equity commenced against Department arising out of a Project in one of Department**'s** regions, shall be in the county in that Region where Department regional headquarters is located.

16.5 That the service of legal process or any notices in connection with a dispute or controversy arising out of this Contract, by United States registered mail, postage prepaid, addressed to the Designated representative of Department at the address stated in the Contract. Documents shall constitute good and valid service of process upon Engineer.

16.6 To waive any defense based on or alleging lack of jurisdiction, improper venue, or invalid service, if there is compliance with paragraphs 16.3 and 16.4 in this Article.

16.7 This Contract may be presented in court as conclusive evidence of the foregoing agreement.

ARTICLE 17 - Sales and Use Tax Exemption

Contractor represents that this project has been bid in such a manner that Department has full advantage of available exemptions from sales and compensating use taxes. Accordingly, Contractor agrees to make all payment requests in a manner which affords Department full advantage of such exemptions. Further, Contractor agrees to complete and to require all subcontractors and material men to complete a Contractor Exempt Purchase Certificate in the name of the New York State Department of Environmental Conservation, which shall be furnished to all persons, firms or corporations from whom they purchase materials, equipment or supplies which are tax exempt by reason of the fact that they will be sold to Department, or will be used as an integral component in the construction, rehabilitation, or improvement of any structure of building required by the Contract Documents.

Contractor agrees to maintain and keep, and to contractually require all subcontractors and material men to maintain and keep, records relating to the tax exemption of material, equipment and Supplies for a period of six years. The six year period shall commence to run as of the date of final payment.

ARTICLE 18 - Effective Date

This Purchase Order and all Contract Documents shall take effect as of the date it is approved.

ARTICLE 19 – Vendor Responsibility

The Department recommends that vendors file a required Vendor Responsibility Questionnaire online via the New York State VendRep System. To enroll in and use the New York State VendRep System, see the VendRep System Instructions available at: http://www.osc.state.ny.us/vendrep/vendor_index.htm or go directly to the VendRep System online at https://portal.osc.state.ny.us.

Vendors must provide their New York State Identification Number when enrolling. To request assignment of a Vendor ID or for VendRep System assistance, contact the Office of the State Comptroller's Help Desk at 866-370-4672 or 518-408-4672 or by email at: ciohelpdesk@osc.state.ny.us. Vendors opting to complete and submit a paper questionnaire can obtain the appropriate questionnaire from the VendRep website www.osc.state.ny.us/vendrep or may contact the Department of the Office of the State Comptroller's Help Desk for a copy of the paper form.

ARTICLE 20 - Contract Price

The maximum payment which Department shall pay to Contractor, and which Contractor agrees to accept as full payment for its work under this Agreement, is the total of:

Bid $_____

Plus change order(s)

SECTION VII

Appendix A and Appendix B

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SECTION VIII

General Conditions

ARTICLE 1 - Preliminary Matters

Copies of Documents:

1.1 Department shall furnish to Contractor without charge up to five copies of the Contract Documents. Additional copies of the Contract Documents will be furnished, upon request, at the cost of reproduction.

Preconstruction Conference:

1.2 No later than twenty calendar days after the Effective Date of the Agreement, but before Contractor starts the Work, a conference will be held on a date and at a location set by Department to:

1.2.1 Review, item by item, the requirements of this Article;

1.2.2 Review the qualifications of Contractor's resident superintendent and the qualifications of any Subcontractors and Suppliers of Contractor;

1.2.3 Discuss Contractor's plans for complying with the requirements of Article 5 of the General Conditions;

1.2.4 Formalize procedures for processing of Administrative Agreements, Payment Applications, Shop Drawings and other submittals, Change Orders and Proposed Change Orders, and Contractor requests for clarifications and interpretation of Contract Documents;

1.2.5 Establish a working understanding among the parties as to the Work; and

1.2.6 Discuss any conflicts, errors or discrepancies that Contractor has discovered by review of the Contract Documents.

Commencement of Contract Time and Start of Work at Site:

1.3 Before starting, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures shown thereon and all applicable field measurements. Contractor shall immediately report in writing to Engineer any conflict, error or discrepancy which Contractor may discover and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.

1.4 Before a Contractor may commence Work on the site but no later than 10 calendar days after Notice of Award, Contractor shall submit to Engineer for review and acceptance:

1.4.1 An interim progress schedule indicating Contractor's anticipated schedule for the Work for the first three months in detail and for the remainder of the Work in summary form. If Contractor doesn't intend to perform Work on the date when Contract Time commences, Contractor must notify Department as soon as possible in writing when work will commence so inspection

services can be scheduled to minimize cost to the Department. The interim progress schedule shall include the information specified in paragraphs 1.4.2 and 1.4.3.

1.4.2 An interim schedule of Shop Drawing, material, soil characteristic, sample collection and analytical test result submissions covering the various stages of Work detailed in the first three months of the interim Progress Schedule; and

1.4.3 An interim schedule of values on the form provided by Engineer covering the various stages of Work detailed in the first three months of the interim Progress Schedule. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work which will be confirmed in writing by Contractor at the time of submission.

1.5 Contractor shall start to perform the Work on the date specified in the Notice to Proceed in a manner consistent with the Contract Documents. No Work shall be done prior to the date specified in the Notice to Proceed unless written permission to do so is given by the Department to the Contractor.

Finalizing Interim Schedules:

1.6 Contractor shall submit a proposed progress schedule to finalize the interim schedules submitted in accordance with paragraph 1.4 and the requirements of the Progress Schedule Section of the Standard Specification no later than twenty days after starting work at the site. The progress schedule shall be acceptable to Engineer and Department as providing an orderly progression of the Work to completion within the Contract Time, but such acceptance will not relieve Contractor from full responsibility for the progress or scheduling of the Work. The schedule of Shop Drawing, material, soil characteristic, sample collection, and analytical test results submissions shall be acceptable to Engineer and Department as providing a workable arrangement for processing the submissions. The schedule of values shall be acceptable to Engineer and Department as to form and substance. The first Application for Payment shall not be processed unless Contractor has submitted acceptable schedules.

ARTICLE 2 - Contract Documents: Intent, Amending, Reuse

Intent:

2.1 The Contract Documents comprise the entire agreement between Department and Contractor concerning the Work. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.

2.2 The Contract Documents describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any work, materials or equipment that may be necessary to satisfactorily complete the contract must be supplied whether or not specifically called for. When words which have a well-known technical or trade meaning are used to describe Work, materials or equipment, such words shall be interpreted in accordance with that meaning. Reference to standard specifications, manuals or codes of any technical society, organization or association, or to the Laws of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code or Laws in effect at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids), even though reference may be specifically made to an earlier standard. If there is any conflict or discrepancy between standard specifications, manuals, or codes of any technical society, organization or association, or between Laws, the Engineer shall determine which shall apply and shall be binding on Contractor. Contractor has a duty to comply with the latest standard specification, manual, code, or Laws in effect at the time of opening of bids, without any

increase in Contract Price or extension in Contract Time. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in paragraph 8.4. However, no provision of any referenced standard specification, manual or code (whether or not specifically incorporated by reference in the Contract Documents) shall be effective to change the duties and responsibilities of Department, Contractor or Engineer or any of their consultants, agents or employees from those set forth in the Contract Documents. If there is any conflict or discrepancy between the provisions of the Contract Documents and any such referenced standard specification, manual, or code of any technical society, organization or association, the provisions of the Contract Documents will take precedence.

2.3 If during the performance of the Work, Contractor finds a conflict, error or discrepancy in the Contract Documents, Contractor shall so report to Engineer in writing at once and before proceeding with the Work affected thereby, and shall obtain a written interpretation or clarification.

Engineer will promptly investigate the matter and respond to Contractor. Until such interpretation or clarification is obtained from Engineer, any Work done by Contractor after the discovery of such a conflict, error or discrepancy, which is directly or indirectly affected by same, will be at Contractor's own risk and Contractor shall bear all cost arising therefrom. In resolving such conflicts, errors or discrepancies, the Contract Documents shall be given preference in the following order:

2.3.1 First, in accordance with the order of preference stated in the conflicting parts of the Contract Documents as provided by Article 4 of the Agreement;

2.3.2 In all cases, figured dimensions shall govern over scaled dimensions, but Work not dimensioned shall be as directed, and Work not particularly shown, identified, sized, or located shall be the same as similar parts that are shown or specified. Detail Drawings shall govern over general Drawings, larger scale Drawings take precedence over smaller scale Drawings, Change Order or Proposed Change Order Drawings govern over Contract Drawings, and approved Shop Drawings govern over Contract Drawings. Specifications shall govern as to products, execution and workmanship, and Drawings shall govern as to locations, dimensions, or quantities to be furnished. Further, in all cases where specifications, notes or details in two or more Specifications, or in two or more Drawings, conflict, the requirement calling for the larger quantities, or higher quality product or workmanship shall prevail and be binding on Contractor, unless otherwise directed by Engineer.

Amending and Supplementing Contract Documents:

2.4 The Contract Documents may be amended to provide for additions, deletions and revisions in the Work or to modify the terms and conditions thereof in one or more of the following ways as defined in Section 2, "Terms and Definitions."

2.4.1 An Administrative Agreement,

2.4.2 A Change Order (pursuant to Article 9), or

2.4.3 A Proposed Change Order signed by Department (pursuant to Article 9).

Contract Price and Contract Time may only be changed by a Change Order.

2.5 In addition, the requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, not involving an adjustment in Contract Price or Contract Time, in one or more of the following ways:

2.5.1 A Field Order (pursuant to Article 8.4),

2.5.2 Engineer's approval of a Shop Drawing or sample (pursuant to Article 5.23 thru 5.29), or

2.5.3 Engineer's written interpretation or clarification (pursuant to Article 8.3).

Reuse of Documents:

2.6 Neither Contractor nor any Subcontractor or Supplier or other person or organization shall have or acquire any title to or ownership rights in any of the Drawings, specifications or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or Design Engineer; and they shall not reuse any of them on extensions of the Project or any other project without the written consent of Engineer or, and Department.

ARTICLE 3 - Availability of Lands; Physical Conditions; Reference Points

Availability of Lands:

3.1 As indicated in the Contract Documents, Department shall make available the lands upon which the Work is to be performed, rights-of-way and easements for access thereto, and such other lands as are designated for the use of Contractor. Easements or other authority for permanent structures or permanent changes in existing facilities will be obtained and paid for by Department, unless otherwise provided in the Contract Documents. If Contractor believes that any delay in Department's furnishing of these lands or easements entitles Contractor to an extension of the Contract Time, Contractor may make a request therefore as provided in Article 10 of the General Conditions. If Department and Contractor are unable to agree concerning such an extension, a claim may be made as provided in Articles 9, 10 and 11 of the General Conditions.

3.2 Any lands and easements for access not furnished by Department which Contractor deems necessary for the Work, including but not limited to requirements for temporary construction facilities, access and egress, or for storage of materials, shall be provided by Contractor at no increase in Contract Price nor extension in Contract Time. Contractor shall obtain all necessary permits and written approvals from the appropriate jurisdictional agencies and property owner(s) for use of premises not furnished by Department as described above, and for the use of all off-site areas needed for the Work including but not limited to off-site borrow pits, and waste and disposal areas. If permits and approvals do not specify the required treatment, if any, of said areas during and at the completion of the Work, the Progress Schedule must describe such treatment. Copies of all permits and approvals applicable to said areas shall be filed with the Engineer before utilization of any said areas. Contractor shall have sole responsibility for any property damage or personal injuries occasioned by an act or omission of Contractor in respect to all lands, and easements obtained pursuant to this paragraph.

3.3 Engineering survey horizontal and vertical control reference points for construction which are specified in the Contract Documents or which in Engineer's judgment are necessary to enable Contractor to proceed with the Work, will be provided by Department. Contractor shall be responsible for laying out the Work using such reference points, shall protect and preserve the established reference points; and shall make no changes or relocations without the prior written approval of Engineer. Contractor shall notify Engineer in writing whenever any reference point is lost or destroyed or requires relocation because of necessary changes in grades or locations; and shall be responsible for the accurate replacement or relocation of such reference points by a professionally qualified surveyor at Contractor's expense.

Physical Conditions and Existing Structures:

3.4 **Explorations and Reports**: Reference is made to the Supplementary Bidding Information and Requirements for identification of those reports of explorations and tests of conditions at the site that have been utilized by Design Engineer in preparation of the Contract Documents; and for identification of those drawings of physical conditions in or relating to existing surface structures (except Underground Facilities referred to in paragraphs 3.6 and 3.7) which are at or contiguous to the site that have been utilized by Design Engineer in preparation of the Contract Documents. Contractor may rely upon the accuracy of the technical data contained in such reports, as to the location where and at the point in time when data was obtained, but not upon non-technical data, interpretations or opinions contained therein or for the completeness thereof for Contractor's purposes. Except as indicated in the Bidding Information and Requirements Section and in paragraphs 3.11 and 3.12, Contractor shall have full responsibility with respect to subsurface conditions which Contractor could reasonably expect or foresee by reason of the technical data and Contractor's inspection of the site, and with respect to physical conditions in or relating to such surface structures.

3.5 Intentionally left blank.

Physical Conditions - Underground Facilities Shown or Indicated:

3.6 The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the site is based on information and data furnished to the Design Engineer by the owners of such Underground Facilities or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

3.6.1 Department shall not be responsible for the accuracy or completeness of any such information or data; and,

3.6.2 Contractor shall have responsibility: a) for reviewing and checking all such information and data; b) for locating all Underground Facilities shown or indicated in the Contract Documents as to depth and alignment in advance of installations, backfilling or other work required by the Contract Documents; c) for coordination of the Work with the owners of such Underground Facilities during construction, d) for the safety and protection thereof, and e) for repairing any damage thereto resulting from the Work. The cost of and the time required to perform the responsibilities outlined in this paragraph will be considered as having been included in the Contract Price and in Contractor's schedule for the performance of the Work within the prescribed Contract Time(s) and Contractor shall not be entitled to additional payment therefor.

3.6.3 Contractor shall excavate and uncover all Underground Facilities to be crossed or paralleled by the proposed Work a sufficient time in advance to permit change in line and grade of the existing Underground Facility or the proposed Work if the location of the existing Underground Facility should interfere with the Work. Further, a reasonable interval of time, up to thirty days, will be allowed to Engineer and Department in order to resolve issues relating to Underground Facilities shown or indicated which are determined to interfere with the Work. This interval of time will be considered as having been included in the Contract Price and in Contractor's schedule for the performance of the Work within the Contract Time unless otherwise agreed to in writing by Department. If more than thirty days is consumed in resolving such issues, no claim will be allowed unless: 1) Contractor has given the notice required in paragraph 3.7 of the General Conditions, and 2) within fifteen days thereafter,

Contractor has submitted to Department a written Proposed Change Order claim in accordance with the requirement of Article 9, 10 and 11 of the General Conditions and the Standard Specifications.

3.6.4 Where it is necessary for the Work to be close to or between other underground facilities or structures for short distances, Contractor shall shore, block, and protect the other underground facilities or structures to the satisfaction of the utility agency, state agency, municipality or private owner having ownership or jurisdiction over said underground facilities on structures.

3.6.5 Access to various municipal structures shall not be obstructed by Contractor to prevent use of hydrants, valves, manholes, fire alarms, etc. Contractor is to make no connections to existing water mains, or operate valves on existing mains, or otherwise interfere with the operation of the existing water distribution system, without first giving written notice to the owners of such municipal structures and securing their written approval of the proposed action.

Underground Facilities Not Shown or Indicated:

3.7 If an Underground Facility is uncovered or revealed at or contiguous to the site which was not shown or indicated in the Contract Documents and which Contractor could not reasonably have been expected to be aware of, Contractor shall promptly after learning thereof and before performing any Work affected thereby (except in an emergency as permitted by paragraph 5.22), identify the owner of such Underground Facility and give written notice of such uncovering to that owner and to Engineer and Department. Engineer and Department will promptly review the situation to determine the extent to which the Contract Documents should be modified to reflect and document the consequences of the existence of the Underground Facility, and take prompt action to amend the Contract Documents to the extent necessary. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility as provided in paragraph 5.20.

3.7.1 Contractor shall schedule excavation and uncovering Work to begin a sufficient time in advance to allow Engineer's review and the possible amendment to the Contract Documents if unanticipated Underground Facilities are discovered as described in paragraph 3.7. Further, up to thirty days, will be allowed to Engineer and Department to resolve issues and problems related to a report of newly discovered Underground Facilities, not shown or indicated. This interval of time will be considered as having been included in the Contract Price and in Contractor's schedule for the performance of the Work within the Contract Time and Contractor shall not be entitled to any additional payment therefor.

3.7.2 No claim by Contractor under paragraph 3.7 of the General Conditions will be allowed unless more than thirty days has elapsed and 1) Contractor has given the notice required in paragraph 3.7 of the General Conditions, and 2) within fifteen days thereafter, Contractor has submitted to Department a written Proposed Change Order claim in accordance with the requirements of Articles 8, 9, 10 and 11 of the General Conditions, and the Standard Specifications.

Report of Differing Site Conditions:

3.8 If Contractor believes that any subsurface or physical condition uncovered or revealed at the site renders materially inaccurate any information in the Contract Documents or technical data on which Contractor was entitled to rely as provided in paragraph 3.4 or 3.6, Contractor shall, immediately after becoming aware thereof and before performing any Work in connection therewith (except in an emergency as permitted by paragraph 5.22), notify Department and Engineer in writing about the inaccuracy or

difference to allow Department and Engineer to make any necessary changes to minimize the cost of the Work.

3.9 Engineer's and Department's Review**:** Engineer and Department will promptly review the pertinent conditions, determine the necessity of obtaining additional explorations or tests with respect thereto, and notify Contractor in writing of findings and conclusions. Immediately thereafter, Department shall perform or cause to be performed any necessary or appropriate additional investigations and tests with respect to the newly discovered conditions and furnish copies to Contractor.

3.10 Possible Document Change**:** If Engineer concludes that there is a material error in the Contract Documents or that because of newly discovered conditions a change in the Contract Documents is required, a Proposed Change Order or a Change Order will be issued as provided in Article 9 to reflect and document the consequences of the inaccuracy or difference, provided Department has not exercised its right to suspend or terminate under Article 14 of Section 8, "General Conditions", Appendix B, or Article 12 of Section 6 "Agreement."

3.11 Possible Contract Adjustment: An increase or decrease in the cost of, or the time required to perform any part of the Work, whether or not affected by such differing conditions, and a corresponding adjustment in Contract Price or Contract Time in accordance with Articles 9, 10 and 11 of the General Conditions, or any combination thereof, may be allowable to the extent that they are attributable to any such inaccuracy or difference which Contractor could not reasonably have been expected to anticipate or be aware of. If Department and Contractor are unable to agree as to the adjustment in Contract Price or Contract Time, or if Engineer concludes that there is not a material error in the Contract Documents, or that the uncovered or revealed condition could reasonably have been anticipated by Contractor, and Contractor disagrees, a claim may be made therefor as provided in Articles 9, 10 and 11 of the General Conditions.

3.12 No claim by Contractor under paragraph 3.11 of the General Conditions will be allowed unless: 1) Contractor has given the written notice required in paragraph 3.8 of the General Conditions, and 2) within fifteen days thereafter, Contractor has submitted to Department a written Proposed Change Order substantiating in detail Contractor's proposed adjustments in accordance with the requirements of Articles 9, 10 and 11 of the General Conditions, and the Standard Specifications.

3.13 Responsibilities and Allowances: Contractor shall schedule excavation and uncovering of Work to begin a sufficient time in advance to allow Engineer's review as described in paragraph 3.9, and Department's issuance of a Change Order or a Proposed Change Order as described in paragraph 3.10 in connection with a report of differing conditions. Further, a reasonable interval of time, not less than thirty days will be allowed to Engineer and Department for those functions required to resolve any report of differing conditions. This interval of time will be considered as having been included in the Contract Price and in Contractor's schedule for the performance of the Work within the Contract Time. If more than thirty days is used, no claim will be allowed unless (1) Contractor has given the written notice required in paragraph 3.8 of the General Conditions, and (2) within fifteen days thereafter, Contractor has submitted to Department a written Proposed Change Order claim in accordance with the requirements of Articles 8, 9, 10 and 11 of the General Conditions, and the Standard Specifications.

ARTICLE 4 - Bonds and Insurance

Performance and Other Bonds:

4.1 Contractor shall furnish performance, labor and material payment Bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all Contractor's obligations

under the Contract Documents. These Bonds shall remain in effect until at least one year after the date when final payment is made, unless otherwise provided by Law or by the Contract Documents. Contractor shall also furnish such other Bonds as are required by the Supplementary Conditions. All Bonds shall: a) be in the form prescribed by the Contract Documents; and b) be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and As Acceptable Reinsuring Companies" as published by the U.S. Treasury Department. Also the surety shall be licensed to do business in New York State. All Bonds signed by an agent must be accompanied by an original or a certified true copy of the agent's power of attorney. Contractor's failure to submit and keep in effect a Bond or form of financial security acceptable to Department in the manner required by this paragraph shall be cause for termination. Contractor shall give written notice to Department and reference the site number and project name, if the surety on any Bond furnished by Contractor is declared bankrupt, becomes insolvent, its right to do business is involuntarily terminated by any state or federal agency, it ceases to meet the requirements of paragraph 4.1, Contractor, if required by Department, shall within fourteen days substitute another Bond or Surety, in an acceptable form of financial security. The top of all bonds shall have "NYSDEC-DER Site No."

If the provision of any bond requires that the surety be notified of any change in the Work, it shall be Contractor's responsibility to so notify the surety. Contractor shall furnish Department any modified bond.

Insurance - All Types:

4.2 Contractor shall purchase and maintain at its own expense the specific coverages and types of insurance set forth in this Article 4.2 through 4.3.3.

4.2.1 Contractor shall not commence or continue to perform any work unless and until Contractor has in full force and effect all required insurance, and until Contractor has submitted true copies of all endorsements (i.e., amendments) and a copy of the Certificate of Insurance attached herein to Department evidencing the specific insurance coverage required. No payment for work performed shall become due and payable unless current certificates and endorsements have been received.

4.2.2 Contractor shall not permit any Subcontractor, Supplier or other person or organization to perform Work unless the following insurance requirements at a minimum have been complied with by such Subcontractor, Supplier or other person or organization and proof of the issuance of all policies of insurance has been delivered to Contractor.

4.2.2.1 Comprehensive general liability insurance providing coverage as herein required of Contractor including Contractors' Protective Liability Insurance, Completed Operations Insurance, Products Liability Insurance and Contractual Liability Insurance. Insurance must be project specific or contain an endorsement (i.e., amendment) in writing (including print or stamp) added to and made part of the insurance contract for the purpose of changing the original terms such that the general aggregate limit applies separately to each of Contractor's projects away from premises owned by or rented to Contractor.

Commercial General liability insurance with a limit of not less than $1,000,000 each occurrence. Such liability shall be written on the Insurance Service Office=s (ISO) liability arising from premises operations, independent contractors= operations, products-completed operations, broad form property damage, personal

and advertising injury, cross liability coverage, liability assumed in a contract (including tort liability of another assumed in a contract) and explosion, collapse and underground coverage.

X Products and Completed Operations Coverage shall include a provision that coverage will extend for a period of at least twelve (12) months after the date of final completion and acceptance by the Department of all of Contractor's work.

4.2.2.2 Comprehensive Business automobile liability insurance with a limit of not less than $1,000,000 with Department and Engineer listed as an additional insured.

4.2.2.3 Policy covering the obligations of the Contractor in accordance with the provisions of the Worker's Compensation Law, Employers Liability, and Disability Benefits This contract shall be void and of no effect unless the Contractor procures the Workers Compensation policy and maintains it until final acceptance of the work.

The only forms which are accepted as proof of Workers' Compensation and Disability Insurance are as follows:

Form #	Form Title
C-105.2	Certificate of Worker's Compensation Insurance
CE-200	Certificate of Attestation of Exemption – (no employees)
U-26.3	State Insurance Fund Version of the C-105.2 form
SI-12	Certificate of Worker's Compensation Self-Insurance
DB-120.1	Certificate of Disability Benefit Insurance
DB-155	Certificate of Disability Benefit Self-Insurance
GSI-105.2	Certificate of Participation in Worker's Group Comp Self-Insurance

An ACORD form is not acceptable proof of Worker's Compensation coverage All of the above referenced forms, except CE-200, SI-I2 & DB-155 must name: The New York State Department of Environmental Conservation, 625 Broadway, Albany, NY 12233, as the Entity Requesting Proof of Coverage (Entity being listed as the Certificate holder). Additional information can be obtained at the Worker's Compensation website:
http://www.wcb.state.ny.us/content/main/Employers/Employers.jsp

4.2.2.4 Owner's **(**Department's**)** and Contractor=s Protective Liability Insurance issued to and in the name of The People of the State of New York, the Department**,** and the Engineer with limits not less than $1,000,000 per occurrence.

4.2.2.5 Pollution Liability Insurance: If the work involves abatement, removal, repair, replacement, enclosure, encapsulation and/or disposal of any hazardous material or substance, the Contractor shall maintain in full force and effect throughout the Term, pollution legal liability insurance with limits of not less than $1,000,000, providing coverage for bodily injury and property damage, including loss of use of damaged property or of property that has not been physically injured. Such policy shall provide coverage for actual, alleged or threatened emission, discharge, dispersal, seepage, release or escape of pollutants or in the investigation, settlement or defense of any claim, suit, or proceedings against the State of New York and/or

the Department and/or the Engineer, arising from Contractor**=s** work and list Department as an additional insured. Claims made policies shall have a one (1) year tail beyond the date Department determines physical completion.

X If coverage is written on claims-made policy, the Contractor warrants that any applicable retroactive date precedes the effective date of this Contract; and that continuous coverage will be maintained, or an extended discovery period exercised, for a period of not less than two years from the time work under this Contract is completed.

4.2.2.6 Errors and Omissions: If providing professional services, Contractor shall maintain, or if subcontracting professional services, shall certify that its subcontractor maintain errors and omissions liability insurance with a limit not less than $1,000,000 per loss.

X Such insurance shall apply to professional errors, acts or omissions arising out of the scope of services covered by this contract and may not exclude bodily injury, property damage, pollution or asbestos related claims, testing, monitoring, measuring or laboratory analyses.

X If coverage is written on a claims-made policy, the Contractor warrants that any applicable retroactive date precedes the effective date of this contract; and that continuous coverage will be maintained, or an extended discovery period exercised for a period not less than two years from the time the work under this contract is completed.

4.2.3 Insurance shall be issued by carriers licensed to do business in New York State. Each insurance carrier must be rated at least AA-@ Class AVII@ in the most recently published Best=s Insurance Report. If during the term of the policy, a carrier=s rating falls below AA-@ Class VII, the insurance must be replaced no later than the renewal date of the policy, with an insurer acceptable to the Department and rated at least AA-@ Class VII in the referenced report.

4.2.4 Acceptance by Department of the insurance provided by Contractor shall not relieve Contractor from liabilities, obligations, responsibilities or decrease the liabilities of Contractor hereunder. It is understood that Department does not in any way represent that the insurance or the limits of insurance specified in the Article is sufficient or adequate to protect Contractor's interests or liabilities, but are merely minima.

4.2.5 All insurance shall be maintained in full force and effect until the Contract has been fully and completely performed, as set forth in the Contract Documents. Completed operations insurance shall remain in effect until one year after the date of final acceptance of work under the contract, or one year after Contractor or any Subcontractor performs any work under the Contract, whichever is later. Should any coverage approach expiration during the period in which it must remain in full force and effect, it shall be renewed prior to its expiration, and a certificate again filed with Department. Also, any endorsements (i.e., amendments) which change insurance during the length of the contract shall also be submitted to Department for acceptance. All insurance policies shall require notice to Department 30 days prior to expiration, termination, or suspension of such policy, directed to the attention of Department. If any insurance provided hereunder contains an aggregate limit, the aggregate shall apply separately to this contract and shall not be less than $2,000,000. Expiration of any coverage

shall be grounds for termination of contract for cause, at the option of Department. Department may suspend or terminate this contract unless Contractor maintains in full force and effect, the types and amounts of insurance required by this contract. No later than thirty (30) days prior to the expiration or renewal date of policy the Contractor should supply replacement certificates of insurance.

4.2.6 Contractor shall deliver, if requested by Department, duplicate originals of each policy required by Contract Documents, as well as insurance policies of Subcontractors, in such number as Department may require, and such alternate or additional proof of coverage as Department demands. Contractor shall provide prompt, written notice to the Department and its insurer, of any claims made related to work done hereunder, in accordance with the insurance policy provisions.

4.2.7 Nothing contained in these insurance requirements shall be construed to limit the liability of Contractor or Contractor's insurance carriers.

4.3 If required by the Supplementary Conditions or Law, Contractor shall purchase and maintain at its own expense insurance otherwise deemed necessary by Department with Department listed as an additional insured.

4.3.1 Where special or unusual hazards peculiar to this contract are foreseeable, Contractor shall take such steps as are necessary to insure itself against such hazards and be responsible for any damage, including water, which results from the occurrence of the hazards in connection with the performance of Work under the Contract.

4.3.2 Contractor shall purchase and maintain insurance which complies with the requirements of the Flood Disaster Protection Act.

4.3.3 Contractor shall maintain until the physical completion date builder's risk insurance on the Builder's Risk Completed Values Form with extended coverage, on the value of the work which shall be the contract amount. Whenever applicable, the Contractor's Interest Completed Value Form may be used. The extended coverage endorsement may include a loss deductible clause of $100.00. Department shall be listed as an additional insured. The Builder's Risk policy shall include the following endorsement. "It is made a condition of this insurance that occupancy of the premises shall not require consent of the insurance company nor rate of adjustment."

ARTICLE 5 - Contractor's Responsibilities

Supervision and Superintendence:

5.1 Contractor shall supervise and direct the Work required by the contract competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be responsible for the means, methods, techniques, sequences and procedures of construction; except that Contractor shall not be responsible for the negligence of others in the design or selection of a specific means, method, technique, sequence or procedure of construction which is indicated in and required by the Contract Documents. Contractor shall be responsible to see that the finished Work conforms with the Contract Documents.

5.2 Contractor shall keep on the Site of the Work at all times during its progress, a competent and reliable resident superintendent, who shall not be replaced without written approval of Department. The

superintendent will be Contractor's representative at the site and shall have authority to act on behalf of Contractor. All communications given to the superintendent shall be as binding as if given to Contractor.

5.2.1 Department may require immediate replacement of the superintendent upon written notice for cause.

5.2.2 The superintendent and similar authorized representatives of any Subcontractors as requested by Department or Engineer shall attend all meetings pertaining to the Work.

5.2.3 Whenever the superintendent is not present for performance of a particular part of the Work and Engineer is not able to give to Contractor, through the superintendent, information relative to an interpretation of the Contract Documents, or relative to disapproval or rejection of materials or the performance of such work, Engineer may so inform the worker in charge of such Work. Information so given shall be binding as if given to superintendent.

5.2.4 Contractor shall issue all communications to Department through Engineer except as provided by Contract Documents. All written correspondence to Engineer shall be copied to Department.

Labor, Working Hours, Materials and Equipment:

5.3 Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall, at all times, employ labor and equipment which shall be sufficient to prosecute the several classes of work to full completion in the manner and time specified. All workers must have sufficient skill, experience and Health and Safety training required to perform properly the work assigned them. All workers engaged on special or skilled work shall have had sufficient experience in such work to perform properly and satisfactorily including operation of any equipment involved. Any person employed by Contractor or Subcontractor whom the Engineer or Department may determine incompetent or unfit to perform the work shall be at once discharged or reassigned and not again be employed on Work in connection with this Contract. The Contractor may request review by Department regarding the discharge of such employee(s). Contractor shall at all times maintain good discipline and order at the site. Except in connection with the safety or protection of persons or the Work or property at the site or adjacent thereto, and except as otherwise indicated in the Contract Documents, all Work at the site shall be performed during normal working hours as defined in paragraph 5.3.1 below, and Contractor shall not permit overtime Work or the performance of Work during hours other than normal Working hours without: a) prior written notice to Engineer; b) Department's written consent; and c) written approval from the New York State Department of Labor as required by law.

5.3.1 Normal working hours shall be defined as a normal working schedule which a) does not exceed eight hours per working day, occurring between the hours set forth at the pre-construction conference, or if none are set forth, beginning no earlier than 7:00 a.m. and ending at no later than 5:00 p.m.; and b) does not exceed 40 hours per week, excluding overtime Work, Work on Saturdays, Sundays, and legal holidays (New Years, Memorial Day, Independence Day, Labor Day, Thanksgiving and Christmas). Work during other than normal working hours may be scheduled by Contractor by first obtaining written permission from Department and as provided in Section 5.3. Department shall be entitled to recover extra costs incurred in providing inspection related to Work done during other than normal working hours in accordance with paragraph 5.3.5 below.

5.3.2 If Contractor, for convenience, voluntarily chooses to schedule Work during hours other than normal working hours at no increase in Contract Price, Contractor shall submit details of such proposed schedule with the interim Progress Schedule described in paragraph 1.6 of the General Conditions. Any Progress Schedule calling for Work outside of normal working hours shall be reviewed for acceptance by Engineer and Department and must be in accordance with the requirements of the New York State Labor Law and Articles 1.6 and 5.3 of the General Conditions.

5.3.3 If at any time subsequent to the submission and approval of the Progress Schedule pursuant to the General Conditions and the Standard Specifications, an event or delay not meeting the requirements for extensions in Contract Time set forth in Articles 9, 10 and 11 of the General Conditions occurs, and requires Contractor to schedule Work during hours other than normal working hours for Contractor's convenience and at no increase in Contract Price, Contractor shall submit, at least ten working days in advance of the acceleration period, a proposed revised accelerated schedule for review by Engineer and Department. If Department accepts the revised accelerated Progress Schedule, Department will so notify Contractor in writing.

5.3.4 If the accelerated Progress Schedule pursuant to paragraph 5.3.2 or 5.3.3 is accepted by Department, Contractor shall reimburse Department for all extra costs incurred in providing inspection during hours other than normal working hours in accordance with paragraph 5.3.5 below. Acceptance by Department of the accelerated Progress Schedule shall not justify an increase in Contract Price; any increase in Contractor's cost to perform the Work, or any part thereof, whether or not affected by Contractor's initiated acceleration proposal, shall remain the responsibility of Contractor.

5.3.5 Contractor shall reimburse Department for the extra costs incurred in providing inspection during hours other than normal working hours when Department considers that the additional hours are due to Contractor's inefficiencies or delays. Reimbursement may include but may not be limited to costs for Engineer, Resident Project Representatives, administrative expenses and other related costs. Reimbursement for Engineer's charges shall be in amounts equal to Engineer's charges to Department for inspection during hours other than normal working hours under the terms of Engineer's agreement with Department. In the event Contractor fails to pay such costs within 30 days after receipt of an invoice from Department, a Change Order or Proposed Change Order may be issued incorporating the unpaid amounts, and Department shall be entitled to an appropriate decrease in Contract Price.

5.3.6 Department may direct Contractor to accelerate if the progress of Work indicates Contractor may not be able to complete the contract within the contract terms. Contractor shall be responsible for all increased costs due to the acceleration.

5.4 Unless otherwise specified in the Contract Documents, Contractor shall furnish and assume full responsibility for all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, storage areas, temporary facilities and all other facilities and incidentals necessary for the furnishing, performance, testing, start-up and completion of the Work.

5.4.1 All water for testing, flushing and construction shall be furnished by Contractor. If water is available from Department and Department agrees to its use, Contractor shall connect to Department's water system at a point approved by Department. Department will charge Contractor for water used in performing the above functions in accordance with Department's established rate schedule. There shall be installed at each and every connection to any water

supply: (a) a meter accepted by Department or Owner of water supply, and (b) a backflow preventer device accepted by the New York State Department of Health.

5.4.2 In the event that Contractor wishes to utilize water from Department's facilities as a substitute source of test water, Contractor shall submit sufficient information in accordance with paragraph 5.7.2 of the General Conditions to allow Engineer to evaluate the substitution. Additionally, such information shall include a description of the necessary equipment and temporary facilities needed to implement the substitute and an estimate of the costs savings anticipated. In the event that the substitution is accepted by Engineer pursuant to the requirements of paragraph 5.7.3 of the General Conditions and allowed by Department, and the supply of water is inadequate in quantity or quality, Contractor shall be responsible for obtaining other sources of test water at no increase in Contract Price or extension in Contract Time.

5.4.3 Contractor shall light the parts of the Work performed during working hours in the manner required by law and as required by Engineer or Department.

5.5 Except as otherwise provided in the Contract Documents, all materials shall be of good quality, good condition and new, and all equipment shall be new, or should be in good working order and of good quality. As required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instructions of the applicable Supplier except as otherwise provided in the Contract Documents.

5.5.1 Contractor shall provide to Department for Department's benefit through Engineer all manufacturers' warranties for materials, and products incorporated into the Work, or required by the Contract Documents to be furnished by Contractor.

5.5.2 Contractor shall obtain from manufacturers of all materials and products complete information as to any special condition, or restriction to be applied in the use of these items. Should the manner or method of installation, specified performance or test results as set forth in the Specifications be contrary to the manufacturer's recommendations for installation and use of the product, the Contractor shall notify Engineer of same for appropriate action. Lack of such notification shall constitute a certification and guarantee by Contractor that Specification requirements will be met by such materials and products to be incorporated.

5.5.3 Contractor shall submit data on all products to be incorporated into the Work required by the Contract Documents, including but not limited to complete maintenance instructions (including preventive maintenance and operating requirement data) and parts lists in sufficient detail to facilitate ordering replacements, in accordance with the procedures set forth in the Special Supplementary Conditions, the Standard Specifications or the Supplementary Specifications.

Adjusting Progress Schedule:

5.6 Contractor shall report on the status of and any revisions to the Progress Schedule to Engineer and Department by delivering Progress Schedule status and update submittals to Engineer in accordance with the Specifications and Article 1.6 of the General Conditions. If Contractor does not adequately update the Schedule, Department may reject Contractor's requests for payment, provided that Department gives Contractor 10 days written notice of its intention to do so.

"Or-Equal" or Substitute Items:

5.7.1 Whenever materials or equipment are specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the naming of the item is intended to establish the type, function, quality, performance and design criteria required. Unless the name is followed by words indicating that no "or equal" or substitution is permitted, materials or equipment of other Suppliers may be accepted by Engineer if sufficient information is submitted by Contractor to allow Engineer to determine that the material or equipment proposed is equivalent or equal to that named. The procedure for review by Engineer will include the following as supplemented in the Contract Documents. Requests for review of "or equal" or substitute items of material and equipment will not be accepted by Engineer from anyone other than Contractor. If Contractor wishes to furnish or use an "or equal" or substitute item of material or equipment, Contractor shall make written application to Engineer for acceptance thereof, certifying that the proposed "or equal" or substitute shall perform the functions and achieve the results called for by the general design, be similar and of equal substance and quality to that specified and be suited to the same use as that specified.

5.7.1.1 The application shall state that the evaluation and acceptance by Engineer of the proposed "or equal" or substitute shall not prejudice completion of the Work, or any part thereof, within the Contract Time, or contract times (including Contractor's achievement of Substantial Completion on time), whether or not acceptance of the "or equal" or substitute for use in the Work would require a change in the Work, or any part thereof, or would require the Department or others having a contract with Department for Work on the Project to adapt the Contract Documents to the proposed "or equal" or substitute; and whether or not incorporation or use of the "or equal" or substitute in connection with the Work is subject to payment of any license fee or royalty. All variations of the proposed "or equal" or substitute from that specified shall be identified in the application and available maintenance, repair and replacement services shall be indicated. The application shall also contain an itemized estimate of all increases or decreases in the following costs: 1) the cost of, or the time required to perform any part of the Work, and the corresponding adjustments in Contract Price and Contract Time, resulting directly or indirectly from evaluation and acceptance of the proposed substitute, including, but not as a way of limitation, costs and delays associated with redesign, or claims of other contractors affected by the resulting "or equal" or substitute, and 2) increases or decreases in operating, maintenance, repair, replacement or spare part costs, all of which shall be considered by Engineer in evaluating the proposed "or equal" or substitute. In rendering a decision, Department and Engineer shall at a minimum, have access to any available Total Float in the approved Progress Schedule. Engineer may require Contractor to furnish at Contractor's expense additional data about the proposed "or equal" or substitute.

5.7.2 If a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Contract Documents, Contractor may furnish or utilize a substitute only if first approved by Engineer. Contractor shall submit in writing sufficient information to allow Engineer to determine that the substitute proposed is equivalent to that indicated or required by the Contract Documents. The procedures for review by Engineer established by paragraph 5.7.1, and as may be supplemented in the Contract Documents, will apply to reviews under this paragraph.

5.7.3 Engineer shall be allowed a reasonable time as determined by Department within which to evaluate each proposed "or equal" or substitute. Engineer and Department shall be the sole judge of acceptability, and no "or equal" or substitute shall be ordered, installed or utilized without Engineer's prior written acceptance which will be evidenced by either a Change Order or an approved Shop Drawing. Department may require Contractor to furnish at Contractor's expense a special performance guarantee or other financial security with respect to any substitute. Engineer will keep record of the time required by Engineer and Engineer's consultants in evaluating "or equals" or substitutions proposed by Contractor and in making changes in the Contract Documents occasioned thereby. Whether or not Engineer accepts an "or equal" or proposed substitute, Department shall be entitled to an offset against any payment due Contractor for the charges of Engineer and Engineer's consultants for evaluating each proposed "or equal" or substitute after the second submittal on such item. In the event that substitute materials or equipment are accepted and are less costly than the originally specified materials or equipment, then the net difference in cost shall benefit Department, and an appropriate Change Order or Proposed Change Order shall be executed to reflect the difference in cost. If Engineer or Department determine that the deduction proposed by Contractor does not reflect the net difference in cost, then this shall be adequate justification to reject the proposed substitute. Additional construction and/or engineering costs identified after Department's acceptance of the proposal and resulting from installation of an "or equal" or substitute shall be borne by Contractor.

Subcontractors, Suppliers and Others:

5.8.1 Contractor shall not employ nor award Work to Subcontractors in excess of the amount specified in Article 6 of the Supplementary Bidding Information and Requirements Section. Such percentage may be increased by an Administrative Agreement if, during performance of the Work, Contractor requests an increase and Department at its sole discretion determines that the increase would be to Department's advantage. Contractor shall submit to Department a statement stating the character and amount of the work to be subcontracted and the party to whom it is proposed to subcontract the work. Contractor shall not employ any Subcontractor, Supplier or other person or organization whether initially or as a substitute, unless first approved by Department.

5.8.2 Wherever Work to be performed by Contractor or by a Subcontractor is dependent upon Work of other Subcontractor(s) or the work of separate contractor(s), then Contractor shall require such Subcontractor(s) whose Work is so dependent to:

5.8.2.1 Provide necessary notices of delay, data or other requirement(s) for performance of dependent Work or work of separate contractor(s),

5.8.2.2 Supply and/or install items to be built into dependent Work or work of separate contractor(s),

5.8.2.3 Make provisions for dependent Work or work of separate contractor(s),

5.8.2.4 Examine previously placed dependent Work or work of separate contractor(s),

5.8.2.5 Check and verify dimensions of previously placed dependent Work or work of separate contractor(s),

5.8.2.6 Notify Engineer in writing immediately upon determining previously placed dependent Work or work of separate contractor(s), the dimensions of which are unsatisfactory or will prevent a satisfactory installation of Work,

5.8.2.7 Not proceed with Work until the unsatisfactory dependent conditions which prevent satisfactory installation of Work have been corrected.

Installation of Work by Contractor or by a Subcontractor in any given area shall constitute acceptance by Contractor or by such Subcontractor of all previously placed dependent Work or work of separate contractor(s) and after such acceptance Contractor shall not make any claims for additional costs based on alleged deficiencies in such Work.

5.8.3 Whenever other Contractor**s** will perform portion(s) of the work that depend on the Contractor's portion of the Work; Contractor shall provide all of the notices and information listed in 5.8.2 to such other Contractor**s** in a timely manner.

5.9 Contractor shall be responsible and liable to Department and Engineer for Contractor's acts and omissions and all acts and omissions of the Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a contract with any level of Subcontractor or Supplier. Nothing in the Contract Documents shall create any contractual relationship between Department or Engineer and any such Subcontractor, Supplier or other person or organization. Department or Engineer may furnish to any Subcontractor or Supplier, to the extent practicable, evidence of the payments made to Contractor on account of specific Work done.

5.10 The various sections, divisions and subdivisions of the Standard and Supplementary Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade. The Standard Specifications, Supplementary Specifications, and Drawings are complementary to each other and are to be read as a whole. Anything mentioned or shown in a division of such Specifications, or Drawings or in a specific trade Drawing shall be effective as if shown in all divisions of such Specifications and in all Drawings. In addition to the requirements of paragraphs 5.24 through 5.30 of the General Conditions, shop drawings of a specific trade shall be compared to and coordinated with those from other trades by Contractor before submission to Engineer.

5.11 All Work performed for Contractor by a Subcontractor will be pursuant to an appropriate agreement between Contractor and the Subcontractor which specifically binds the Subcontractor to the applicable terms and conditions of the Contract Documents for the benefit of Department.

Patent Fees and Royalties:

5.12 Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, device or intellectual processes which is the subject of patent rights or copyrights held by others, both when a particular invention, design, process, product or device is specified in the Contract Documents for use in the performance of the Work and otherwise. It is the intent of the parties that whenever Contractor is required or desires to use any design, device, material or process covered by letters, patent, trademark or copyright, the right for such use shall be provided for by suitable legal agreements with the patentee or owner, and a copy of this agreement shall be filed with Engineer. However, whether or not such agreement is made or filed as noted, Contractor and Contractor's surety in all cases shall indemnify and hold harmless Department and Engineer and their employees as provided in Appendix B.

Permits:

5.13 Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for any permits or licenses required for performance of Work. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work, which are applicable at the time of opening of Bids, or if there are no Bids on the Effective Date of the Agreement. Contractor shall pay all charges for connections or disconnections required by the Work to Underground Facilities or utilities owned by third parties.

Laws and Regulations:

5.14.1 Contractor shall comply with all Laws applicable to performance of the Work. Except where otherwise expressly required by applicable Laws or Contract Documents, neither Department nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws.

5.14.2 If Contractor observes that the Contract Documents are at variance with any applicable Laws, Contractor shall immediately give Engineer prompt written notice thereof, and any necessary changes will be authorized by one of the methods set forth in paragraph 2.4 and 2.5 of the General Conditions. If Contractor performs any Work knowing or having reason to know that it is contrary to such Laws, and without such notice to Engineer, Contractor shall bear all costs arising therefrom; however, it shall not be Contractor's primary responsibility to make certain that the Specifications and Drawings are in accordance with such Laws.

Taxes:

5.15 Contractor shall pay all sales, consumer, use and other similar taxes required to be paid by Contractor in accordance with the Laws of the State of New York which are applicable during the performance of the Work. Materials, supplies and equipment incorporated into the Work or sold to New York State are exempt from New York State sales tax.

Use of Premises:

5.16 Contractor shall confine the use and storage of construction equipment, the storage of materials and equipment and the operations of workers to the Project site and land and areas identified in and permitted by the Contract Documents and other land and areas permitted by applicable Laws, rights-of-way, permits and easements, and shall not unreasonably encumber the premises with construction equipment or other materials or equipment. Unless otherwise provided in the Contract Documents, use of Department's facilities at or contiguous to the site by Contractor for storage of materials or equipment shall not be permitted. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof or of any land or areas contiguous thereto, resulting from the acts or omissions of Contractor. Should any claim be made against Department or Engineer by any such owner or occupant because of the performance of the Work, Contractor shall promptly attempt to settle with such other party by agreement or otherwise resolve the Claim. Contractor shall indemnify and hold Department harmless in accordance with the provisions of Appendix B.

5.16.1 Temporary buildings (e.g., storage sheds, trailers, shops, offices) and utilities may be erected by Contractor only with the approval of Engineer and shall be built without additional expense to Department. Such temporary buildings and utilities shall remain the property of Contractor and shall be decontaminated as necessary and removed by Contractor at his expense upon completion of the Work; the buildings and utilities may be abandoned and remain at the site with the written consent of Department.

5.16.2 When materials are transported for performance of the Work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by Federal, State, or local law or regulation. When it is necessary to cross curbs, sidewalks or work which is completed or underway on site, Contractor shall protect them from damage, and shall repair any damage caused.

5.16.3 Notwithstanding the designation of site boundaries or the indication of temporary fences or barricades, the provisions of the Contract Documents governing certain phases or portions of the Work may require that certain operations be carried out beyond the site boundaries. Trenching, utility Work, site development, landscaping, other Work, if required beyond such designated limits, shall be scheduled in such a manner as to cause or occasion a minimum of inconvenience or disturbance to or interference with the normal operation of Department, abutting owners and the public. Contractor shall obtain Department's prior approval and all necessary approvals from others, including but not limited to public authorities and utility companies for such operations, and shall conduct such operations expeditiously and restore the affected area to its original condition immediately upon completion of such operations, unless otherwise specified in the Contract Documents.

5.16.4 All existing walks, roadways, paved or landscaped areas on which temporary driveways or walks are rerouted shall be restored to their original condition, immediately upon completion of the phases or portions of the Work for which such features were disturbed unless otherwise specified in the Contract Documents.

5.16.5 Pumping, draining and control of surface and ground water will be carried out so as to avoid endangering the Work or any adjacent facility or property, or interrupting, restricting or otherwise infringing or interfering with the use thereof, or exceeding the limits allowed by Contract Documents, or applicable Law.

5.17 During the progress of the Work, Contractor shall keep the Site free from accumulations of waste materials, rubbish and other debris resulting from the Work. At the completion of the Work Contractor shall remove all waste materials, rubbish and debris from and about the premises as well as all tools, appliances, construction equipment and machinery, and surplus materials, and shall leave the Site clean and ready for Department. Contractor shall restore all pavement, sidewalks, driveways, fences, shrubs, lawns, trees and any other public or private property damaged as a result of the Work under this Contract. All such replacement shall be done in accordance with the applicable specifications and no separate or extra payment will be made unless specifically provided for in the Payment Items. In all cases, said replacement shall be at least equal to the original conditions.

5.18 Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

As-Built Documents:

5.19 Contractor shall maintain in a safe place at the Site one as-built document which shall consist of all Drawings, Specifications, Addenda, written amendments, Change Orders, Proposed Change Orders, field test records, construction photographs, Field Orders and written interpretations and clarifications (issued pursuant to paragraph 8.3) in good order and annotated to show all changes made during construction. Contractor will be required to review with Engineer the status of all as-built documents in connection with Engineer's evaluation of an Application for Payment. Pursuant to paragraph 13.2.1 of the General

Conditions, failure to maintain a current file of such as-built documents up-to-date may be just cause to recommend withholding of payments for Work performed. These as-built documents together with all approved samples and a copy of all approved Shop Drawings shall be available to Engineer for reference at the Site. Upon completion of the Work, these as-built documents, samples and Shop Drawings shall be delivered to Engineer for Department. Failure by Contractor to produce acceptable as-built documents of the above listed items shall be cause for reduction of Contract Price in an amount equal to Department's cost of generating or producing the as-built documents.

Health, Safety and Protection:

5.20 Contractor shall be responsible for initiating, maintaining and supervising all health and safety precautions and programs in connection with the Work which include but are not limited by the Contract Documents and Contractor's Health and Safety Plan. Contractor shall take all necessary precautions for the health and safety of, and shall provide the necessary protection to prevent damage, injury or loss to all employees and other persons and organizations who may be affected thereby. Contractor shall comply with all applicable Laws of any public body having jurisdiction for the health and safety of persons or property in order to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for such health, safety and protection. Contractor shall notify owners of Underground Facilities and utility owners when performance of the Work may affect them, and shall cooperate with them in the protection, removal, relocation and replacement of their property. In addition to any requirements imposed by Laws, Contractor shall shore up, brace, underpin, and protect as may be necessary, all foundations and other parts of all existing structures adjacent to and adjoining the site which are in any way affected by the excavations or other operations connected with performance of the Work under the Contract.

5.21 All damage, injury or loss to any property referred to in the above paragraph caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier or any other person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or caused by anyone for whose acts any of them may be liable, shall be remedied by Contractor; provided that Contractor shall not be responsible for damage or loss attributable to defects in the Drawings or Specifications or to the acts or omissions of Department or Engineer or anyone employed by either of them or anyone for whose acts either of them may be liable, and to the extent not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor. Contractor's duties and responsibilities for the safety and protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a written notice to Department and Contractor in accordance with paragraph 13.11 that the Work is acceptable, except as otherwise expressly provided in connection with Substantial Completion. Department has the right to suspend Work or terminate this contract for cause for Contractor's failure to comply with any health and safety plan required by the Contract Documents or Law.

5.22 Contractor shall designate a responsible representative at the site whose duty shall be the prevention of accidents. This person shall be Contractor's superintendent unless otherwise designated in writing by Contractor to Department.

Emergencies:

5.23 In emergencies affecting or threatening to affect the safety or protection of persons or the Work or property at the site or adjacent thereto when prompt action is required and there is no reasonable opportunity for prior consultation with Engineer or Department, then Contractor, without special instruction or authorization from Engineer or Department, is obligated to act to prevent or mitigate

threatened damage, injury or loss. Contractor shall give Engineer prompt telephonic notice followed by written notice thereof, including any significant changes in the Work or variations from the Contract Documents which Contractor believes have been caused thereby. If Engineer determines that a change in the Contract Documents is required because of the action taken in response to an emergency, an Administrative Agreement, Field Order, Proposed Change Order or Change Order shall be issued to document the consequences of the changes or variations. Contractor shall give Engineer and Department name and number of contact for emergencies during non-Work hours.

Shop Drawings and Samples:

5.24 After checking and verifying all field measurements and after complying with applicable procedures specified in the Contract Documents, Contractor shall submit to Engineer for review and approval in accordance with the accepted schedule of Shop Drawing submissions (see paragraph 1.4, hereof) six copies of all Shop Drawings plus additional copies as required by Contractor, unless otherwise specified in the Contract Documents. All such Shop Drawings shall bear a stamp or other specific written indication that Contractor has satisfied the requirements of the Contract Documents with respect to the review of the submissions including but not limited to subparagraph 5.25 below. All submissions shall be identified as Engineer may require. The data shown on the Shop Drawings shall be complete with respect to quantities, dimensions, specified performance and design criteria, materials and similar data to enable Engineer to review the information as required.

5.25 Contractor shall also submit to Engineer for review and approval with such promptness as to cause no delay in Work, all samples required by the Contract Documents. Contractor shall check all samples, shall identify them clearly as to material, Supplier, pertinent data such as catalog numbers and the use for which intended, and shall submit with them a written certification that Contractor has satisfied the requirements of the Contract Documents with respect to the review of such submissions including but not limited to subparagraph 5.25 below.

5.26 Before submission of each Shop Drawing or sample, Contractor shall certify that all quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers and similar data with respect thereto have been reviewed or that each Shop Drawing or sample has been coordinated with other Shop Drawings and samples and with the requirements of the Work and the Contract Documents.

5. 27 At the time of each such submission, Contractor shall give Engineer specific written notice of each variation that the Shop Drawings or samples may have from the requirements of the Contract Documents, and, in addition, shall cause a specific notation of each such variation to be made on each Shop Drawing submitted to Engineer for review and approval.

5.28 Engineer will review and approve or disapprove Shop Drawings and samples in 14 days. However, Engineer's review and approval of Shop Drawings will be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents and shall not extend to the accuracy of other matters that may be contained in the submittals, including but not limited to such matters as dimensions, quantities, performance of equipment and systems proposed by Contractor, Contractor's means, methods, techniques, sequences or procedures of construction (except where a specific means, method, technique, sequences, and procedures of construction is indicated in or required by the Contract Documents) or to safety precautions or program incident thereto, the correctness of which shall remain the sole responsibility of Contractor. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

5.28.1 When reviewed by Engineer, each submittal of Shop Drawings and samples will be returned to Contractor as either "Approved", "Approved as Noted", "Resubmit with Revisions", or "Disapproved." Submittals stamped as "Approved" or "Approved as Noted" will indicate Engineer's approval thereof, subject to the provisions of paragraph 5.28.

5.28.2 Contractor shall revise and correct Shop Drawings and samples and resubmit them to Engineer for Engineer's second review and return pursuant to paragraph 5.29. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

5.28.3 Costs associated with Engineer's review and return of a Shop Drawing or sample submission other than ones submitted pursuant to paragraph 5.7 of this Section shall be borne by Contractor after the Engineer's second review. Department's charges to Contractor for additional reviews will be equal to Engineer's charges to Department under the terms of Engineer's agreement with Department. In the event Contractor fails to pay such costs within 30 days after receipt of an invoice from Department, funds will be withheld from payment requests and at the completion of the Work, a Change Order or proposed Change Order will be issued incorporating the unpaid amount, and Department will be entitled to an appropriate decrease in Contract Price.

5.28.4 After the Engineer's second review, delays associated with Contractor's resubmittal and Engineer's review and return of a particular Shop Drawing or sample submission shall be the responsibility of Contractor. Such delays shall not justify an increase in Contract Price nor an extension in Contract Time.

5.29 Engineer's review and approval of Shop Drawings or samples shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has in writing called Engineer's attention to each such variation at the time of submission as required by paragraph 5.27 and Engineer has given written approval of each such variation by a specific written notation thereof incorporated in or accompanying the Shop Drawing or sample approval; nor will any approval by Engineer relieve Contractor from responsibility for errors or omissions in the Shop Drawings or from responsibility for complying with paragraph 5.26.

5.30 Where a Shop Drawing or sample is required by the Specifications, any related Work performed prior to Engineer's review and approval of the pertinent submission will be the sole expense and responsibility of Contractor.

Continuing the Work:

5.31 Contractor shall carry on the Work and adhere to the Progress Schedule during all Claims or Disputes with Department. No work shall be delayed or postponed pending resolution of any Claims or Disputes, except as permitted by Article 14 of the General Conditions or as Contractor and Department may otherwise agree in writing.

Weather Protection:

5.32 Contractor shall be responsible for initiating, maintaining and supervising all weather protection precautions and programs in connection with the Work. Additional weather protection provisions, if applicable, are set forth in the Supplementary Conditions, Standard Specifications or Supplementary Specifications.

Cutting and Patching of Work:

5.33 Contractor shall be responsible for all cutting of masonry and other materials, and all fitting, drilling or patching which may be necessary to complete the Work or to make its several parts fit together properly, whether or not such Work is expressly specified in the Contract Documents.

5.34 Contractor shall not damage or endanger any portion of the Work or the work performed by Department or by any separate contractors by cutting, patching or otherwise altering any work, or by excavation. Contractor shall not cut or otherwise alter work performed by Department or any separate contractors except with the written consent of Department and of such separate contractor. Contractor shall not unreasonably withhold from Department or any separate contractor consent to cutting or otherwise altering the Work.

Quality Control:

5.35 Reference is made to the Supplementary Conditions, Standard Specifications and Supplementary Specifications for the identification of Contractor's quality control system requirements under the Contract.

Project Meetings:

5.36 Contractor, along with appropriate Subcontractors, suppliers and manufacturers, shall attend weekly project meetings at the site or as requested by Department or Engineer, for the purpose of discussing and resolving matters concerning the various elements of the Work.

Notification of Emergency Services:

5.37 Contractor shall notify all local Police, Fire Department and Ambulance Services at least twenty-four (24) hours in advance of construction across or adjacent to existing roadways in order that such services might be aware of any disrupted access.

Conflicts Between Contract Documents and Site:

5.38 Contractor shall notify Engineer and Department immediately upon discovering any conflicts, ambiguities, error or inconsistencies in the Contract Documents, between the Contract Documents and the actual Site Conditions, or between the Contract Documents and work being done by others. Failure to promptly notify the Engineer and Department may invalidate Contractor's request for an increase in Contract Price and/or Time.

ARTICLE 6 - Other Work

Related Work at Site:

6.1 Department may perform other work related to the Project at the site by Department's own forces, have other work performed by utility owners, or enter into other contracts for such other work.

6.2 Contractor shall afford each utility owner and other contractor who is a party to a direct contract with Department (or Department, if Department is performing the additional work with Department's

employees) proper and safe access to the site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such work, and shall properly connect the Work with theirs. Contractor shall do all the Work that may be required to make its several parts come together properly and integrate with other work. Contractor shall only alter the work of others with the written consent of Engineer and notice to the other contractors whose work will be affected, and shall not endanger any work of others by altering their work. The duties and responsibilities of Contractor under this paragraph are for the benefit of such utility owners and other contractors.

6.3 If any part of Contractor's Work depends for proper execution or results upon the work of any such other contractor, utility owner or Department, Contractor shall inspect and promptly report to Engineer in writing any delays, defects or deficiencies in such work that render it unavailable or unsuitable for such proper execution and results. Contractor's failure so to report shall constitute an acceptance of the other work as fit and proper for integration with Contractor's Work except for latent or non-apparent defects and deficiencies in the other work.

ARTICLE 7 - Department's Responsibilities

7.1 Department may issue communications to Contractor through Engineer.

7.2 In case of termination of the employment of Engineer, Department shall appoint an engineer whose status under the Contract Documents shall be the same as the former Engineer.

7.3 Department shall promptly furnish the data as required under the Contract Documents and shall make payments to Contractor promptly after they are due as provided in Article 13.

7.4 Department is represented by the Project Field Representative, the Project Manager and the Designated Representative whose duties and authority are set forth in the Contract Documents. Department is also represented by Engineer.

7.5 Department will not be responsible for Contractor's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, unless the Contract Documents specifically impose such a duty on Department. Department will not be responsible for Contractor's failure to perform or furnish the Work in accordance with the Contract Documents.

7.6 Department will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other person or organization performing or furnishing any of the Work.

ARTICLE 8 - Engineer's Duties and Responsibilities

Project Representation:

8.1 The duties and responsibilities and the limitations of authority of Engineer during construction are set forth in the Contract Documents. Engineer's Resident Engineer will assist Engineer in inspecting the performance of the Work. The duties, and authorities of any Resident Engineer and Resident Project Representatives are set forth in the Contract Documents. Secondarily Department is represented as set forth in article 7.4 of the General Conditions.

Visits to Site:

8.2 Engineer shall make any on-site inspections necessary to check the quality or quantity of the Work and to determine if the Work is proceeding in accordance with the Contract Documents. Engineer's duty to visit the site shall in no way be construed to relieve Contractor of its duty to perform the Work in conformance with the Contract Documents.

Clarifications and Interpretations:

8.3 Engineer or Department shall issue with reasonable promptness written clarifications or interpretations of the requirements of the Contract Documents (in the form of Drawings or otherwise) as Engineer or Department may determine necessary, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents.

Authorized Variations in Work:

8.4 Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Time and are consistent with the overall intent of the Contract Documents. These may be accomplished by a Field Order and will be binding on Contractor who shall perform the Work involved promptly. If Contractor believes that a Field Order justifies an increase in Contract Price or an extension in Contract Time, Contractor shall be required to deliver a written notice thereof to Engineer in accordance with the provisions of Article 9 of the General Conditions. If Department and Contractor are unable to agree as to amount and extent thereof, a claim may be made pursuant to Articles 10 and 11 of the General Conditions.

Rejecting Defective Work:

8.5 Engineer, based on its inspections, reports of its Resident Engineer, other information available to it and its professional experience and training, or the direction of Department, may disapprove or reject Work at any time during the construction of the Work, which Engineer believes to be Defective Work. Engineer shall also have authority to require special inspection or testing of the Work as provided in paragraphs 12.4 through 12.10 of the General Conditions, whether or not the Work is fabricated, installed, or completed. When Contractor has been notified by Engineer of disapproval or rejection of Defective Work, Contractor shall take immediate action to correct same at no additional cost.

Shop Drawings, Change Orders and Payments:

8.6 Engineer's responsibilities regarding Shop Drawings and samples, are set forth in paragraphs 5.24 through 5.30 of the General Conditions. If Contractor believes that Engineer's approval of a Shop Drawing or sample justifies an increase in Contract Price or an extension in Contract Time, Contractor shall be required to deliver a written notice thereof to Engineer in accordance with the provisions of Article 9 of the General Conditions. If Department and Contractor are unable to agree as to amount and extent thereof, a claim may be made pursuant to Articles 10 and 11 of the General Conditions.

8.7 Engineer's duties regarding Change Orders are set forth in Articles 9, 10 and 11 of the General Conditions.

8.8 Engineer's duties regarding Applications for Payment, etc., are set forth in Article 13 of the General Conditions.

Determinations for Unit Prices:

8.9 Engineer will review and make preliminary determinations on the actual quantities and classifications of acceptable Unit Price Work performed by Contractor. Engineer will review such preliminary determinations with Contractor, before rendering a written decision thereon by recommendation of an Application for Payment or otherwise. Department shall review and approve Engineer's determinations. Department's decisions thereon shall be final unless within 10 days after the date of any such decision, Contractor delivers to Department and to Engineer written notice of disagreement with Engineer's Determination including written documentation supporting such position.

Engineer's Determinations and Claims:

8.10 Engineer shall interpret the Contract Documents and determine the acceptability of the Work thereunder subject to Department's right to modify or overrule Engineer's determination after consultation with Engineer and Contractor. Claims or other matters relating to the acceptability of the Work or the interpretation of the requirements of the Contract Documents pertaining to the performance and furnishing of the Work, or in respect to changes in the Contract Price or Contract Time will be referred to Engineer in writing with a request for a formal determination in accordance with this paragraph. Engineer shall render such determination in writing within a reasonable time. Written notice of Contractor's disagreement with Engineer's Determination constituting a Claim shall be delivered by Contractor to Engineer and Department within ten days after receipt. Written documentation supporting such position shall be submitted to Department within thirty days of-Engineer's Determination, unless the Department allows an extension of time to submit additional information.

8.10.1 A written demand or written assertion by Contractor seeking the payment of money is not a Claim under this Article until certified as required below. Contractor shall submit with the claim a certification executed by Contractor's Authorized Representative specified in the Contract Documents that:

8.10.1.1 The Claim is made in good faith,

8.10.1.2 Supporting Cost and Pricing Data are current, accurate, and complete to the best of the Contractor's knowledge and belief, and

8.10.1.3 The amount of the Claim accurately reflects the adjustments in Contract Price or Contract Time for which Contractor believes Department is liable.

8.10.2 Contractor agrees that all unresolved claims shall be subject to the Dispute Resolution procedures as provided in Article 9 in Appendix B to the Agreement.

8.10.3 Contractor shall proceed diligently with performance of Work under this Contract, and comply with any decision of Engineer or Department pending final resolution of any request for relief, Claim, appeal, or action arising under the Contract.

Limitations on Engineer's Responsibilities:

8.11 Whenever in the Contract Documents the terms "as ordered," "as directed," "as required," "as allowed," "as approved," or terms of like effect or import are used, or the adjectives "unreasonable," "unsuitable," "acceptable," "proper," or "satisfactory," or adjectives of like effect or import are used to describe a requirement, direction, review or judgment of Engineer as to the Work, it is intended that such requirement, direction, review or judgment will be solely to evaluate the Work for compliance with the Contract Documents unless there is a specific statement indicating otherwise. The use of any such term or adjective shall not be effective to assign to Engineer any duty or authority to supervise or direct the

furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraph 8.12 or 8.13.

8.12 Engineer will not be responsible and Contractor remains responsible for Contractor's means, methods, techniques, sequences and procedures of construction, and the safety precautions and programs incident thereto, unless Contract Documents specifically impose such a duty on Engineer. Engineer will not be responsible for Contractor's failure to perform or furnish the Work in accordance with the Contract Documents.

8.13 Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other person or organization performing or furnishing any of the Work.

ARTICLE 9 - Changes in the Work

9.1 Department may, at any time or from time to time and without notice to any surety, order additions, deletions or revisions in the Work or other requirements, which the performance of, or compliance with, is established in the provisions of the Contract Documents. These changes will be initiated by Proposed Change Orders, in Administrative Orders and authorized by Change Orders. Upon receipt of an Administrative Order, or Proposed Change Order, the Contractor shall proceed with the Work involved. All such Work involved shall be performed in accordance with the applicable conditions of the Contract Documents. If an Administrative Order or Proposed Change Order causes an increase or decrease in the Contract Price or an extension or shortening of the Contract Time, an equitable adjustment will be made in a duly executed Change Order. The value of any work covered by a Proposed Change Order or a Change Order for an increase or decrease in the Contract Price or the Contract Time, hereafter called the "Work involved", shall be determined by one of the following methods:

9.2 Department may order minor changes in the Work which do not involve an adjustment in the Contract Price or in the Contract Time and are consistent with the overall intent and purpose of the Contract Documents. Such minor changes will be authorized by a Field Order which shall be binding on Department and Contractor who shall perform such changes promptly. If Contractor believes that a Field Order justifies an increase in the Contract Price or the Contract Time, Contractor shall make written notification in accordance with Section VIII, Article 8.10 within 3 days and provide documentation within 15 days in a Proposed Change Order to Engineer.

9.3 Additional work performed without authorization of a Proposed Change Order will not entitle Contractor to an increase in the Contract Price or an extension in the Contract Time, except in the case of emergency work as provided in paragraph 5.23 of the General Conditions and except in the case of uncovering Work as provided in paragraph 12.9 and 12.10 of the General Conditions.

9.4 When changes in the Work, involving adjustments to the Contract Price or Contract Time are contemplated by Department, pursuant to paragraph 9.1, Contractor may be requested to submit a cost proposal prior to being authorized to proceed with the change. If Department and Contractor are unable to agree and Department orders the change, or if Department pursuant to Engineer's review and decision concludes that the written direction, instruction, interpretation or clarification, approval, decision or determination does not require an increase in Contract Price or extension in Contract Time, Contractor will be required to carry on with the Work involved and adhere to the Progress Schedule. Contractor proposals substantiating the amount and extent of any proposed adjustment in Contract Price or Contract Time shall become due within three days of receipt (or issuance) of a Proposed Change Order initiated by Department (or Contractor), and shall be submitted in accordance with Articles 8, 9, 10 and 11 of the General Conditions. Any delays in the submittal of Contractor proposals relative to adjustments in Contract Price or Contract Time will not justify a delay or constitute basis for an increase in Contract

Price or an extension in Contract Time. Unless Contractor gives written notice of intent to appeal Department's determination or to file a claim in accordance with Article 8 of the General Conditions, within said thirty days of the issuance of a Proposed Change Order or the rejection of a Proposed Change Order, Department's determination shall be final and binding upon Contractor.

9.5 Upon receipt of a cost proposal from Contractor, pursuant to paragraph 9.4 above, and if Department agrees with the increase or decrease in the Contract Price or Contract Time, Department shall authorize the change in the Work by issuing a Proposed Change Order and shall begin preparation of a Change Order covering the Work involved.

9.5.1 A Change Order shall also be any other written order, including direction, instruction, interpretation, determination, or decision embodied in a Field Order, or in a response to a request for clarification or interpretation of the requirements of the Contract Documents, or in an approval of a Shop Drawing or sample, or in a decision relating to a report or differing or unforeseen conditions or the acceptability of Work or Admistrative Order which causes any change, provided that Contractor gives Engineer and Department a dated written notice identifying the written order and stating circumstances and other information required in this Article and in Articles 8, 9, 10 and 11 of the General Conditions indicating that Contractor considers the written order a Proposed Change Order.

9.5.2 Contractor quotations substantiating the amount or extent of any proposed adjustment in Contract Price or Contract Time shall cover all known amounts or extents to which Contractor is entitled as a result of the proposed change. Pursuant to this requirement of the Contract Documents, Contractor acknowledges and agrees to the following waivers when executing Change Orders or Proposed Change Orders authorized in accordance with paragraph 9.4 of the General Conditions:

9.5.2.1 Contractor acknowledges and agrees that the adjustments in Contract Price and Contract Time stipulated in this Change Order represent full compensation for all increases or decreases in the cost of, or the time required to perform the entire Work under the Contract, arising directly or indirectly from this Change Order, including this and all previous Change Orders. Acceptance of this waiver constitutes an agreement between Department and Contractor that the Change Order represents an all inclusive, mutually agreed upon adjustment to the Contract for all direct, indirect and consequential costs and delays, and that Contractor shall waive all rights to file a claim on this Proposed Change Order after it is properly executed.

9.5.2.2 Acceptance by Contractor is evidence of mutual accord and satisfaction for those adjustments in Contract Price and Contract Time stipulated in this Proposed Change Order, that Contractor shall submit detailed supporting data within fifteen days in accordance with Articles 10 and 11 of the General Conditions to allow negotiation of outstanding issues, and that the changes ordered and documented by this Proposed Change Order will be incorporated into a future Change Order subsequent to agreement on all outstanding issues.

9.6 If the provision of any bond requires that the surety be notified of any change in the Work, it shall be Contractor's responsibility to so notify the surety and the amount of each applicable bond shall be adjusted accordingly. Contractor shall furnish proof to Department of such adjustment.

9.7 No claim by Contractor for an adjustment under this Article of the General Conditions shall be allowed if asserted after the date of final payment under this Contract.

ARTICLE 10 - Change of Contract Price or Time

10.1 The Contract Price constitutes the total compensation, subject to authorized adjustments, payable to Contractor for performing the Work. All duties, responsibilities and obligations assigned to or undertaken by Contractor shall be at its own expense without any change in the Contract Price or the Contract Time.

10.2 The Contract Price and the Contract Time may only be changed by a duly executed Change Order.

10.3 The value of the Work involved shall be determined by one of the following methods:

10.3.1 Where the Work involved is covered by unit prices contained in the Contract Documents, those unit prices shall be used to determine the cost of the Work involved.

10.3.2 Where the Work involved is not covered by unit prices contained in the Contract Documents, by application of mutually agreed upon unit prices to the quantities of the items of Work involved.

10.3.3 By mutual acceptance of a lump sum.

10.3.4 On the basis of the cost of the Work involved as provided in paragraph 10.4 of this Article plus a Contractor's fee for overhead and profit as provided in paragraph 10.7 of this Article.

10.3.5 Where the Department and Contractor cannot agree on any of the methods described above, and Department directs Contractor to proceed with the Work involved as provided in Article 10 of the General Conditions.

10.4 The Cost of the Work involved shall include the following items and shall not include any of the costs disallowed under this Article 10 of the General Conditions:

10.4.1 Payroll costs of employees in the direct employ of the Contractor in the performance of the Work involved in job classifications agreed upon by Department and Contractor. Payroll costs shall include, but shall not be limited to, salaries and wages plus the cost of fringe benefits which shall include social security contributions, unemployment, excise and payroll taxes, workers or workmen's compensation, health and retirement benefits, and sick leave applicable thereto. Such employees may include foremen at the site but shall not include employees in the job classifications itemized in paragraphs 10.6.1. The costs of performing the Work involved during other than normal working hours, as defined in paragraph 5.3.1, shall be included in the above to the extent authorized by Department and as required by Law.

10.4.2 Cost of all materials and equipment furnished and incorporated into the Work involved, including costs of transportation and storage thereof, and suppliers' field services connected therewith. All cash discounts shall accrue to Contractor unless Department deposits funds with Contractor with which to make payments, in which case, the cash discounts shall accrue to Department. All trade discounts, rebates and refunds, and all returns from sale of surplus materials and equipment shall accrue to Department, and Contractor shall make provisions so that they may be obtained.

10.4.3 Payments made by Contractor to subcontractors who perform a part of the Work involved. If required by Department, Contractor shall obtain competitive bids from prospective subcontractors acceptable to Contractor and shall deliver such bids to Department who will then determine which bids will be accepted. If a subcontract provides that the subcontractor is to be paid on the basis of cost plus a fee, the subcontractor's cost shall be determined in the same manner as Contractor's cost of the Work involved. All subcontracts shall be subject to the provisions of the Contract Documents, insofar as applicable.

10.4.4 Costs of special consultants, including but not limited to engineers, architects, testing laboratories, surveyors, attorneys and accountants, employed for services specifically related to the Work involved to the extent authorized in writing by Department.

10.4.5 Costs of Contractor owned equipment - Contractor shall be reimbursed for his ownership and operating costs for self owned equipment employed on the Work involved. The rates of reimbursement shall be as listed in most recent published edition of the Rental Rate Blue Book published by Dataquest, Inc. in effect on the date of issuance of the applicable Change Order or Proposed Change Order, or prior to performing the Work in a claim for an increase or decrease in the Contract Price and applied in the following manner.

10.4.5.1 Ownership costs - The equipment rates for ownership costs include depreciation on the original purchase, insurance, applicable taxes, interest on investment, storage, repairs, mobilization to and demobilization from the site of the Work involved, and profit reimbursement will be made for the hours on the Work involved. In no event shall the equipment rate billed to Department be at rates exceeding those described below.

10.4.5.2 Less than 8 hours of actual use or necessary for availability as approved by Engineer: The daily rate or the product of the hours of actual use multiplied by the hourly rate, whichever is less.

10.4.5.3 Between 8 hours and 40 hours of actual use: The weekly rate or the product of the hours of actual use used divided by 8 and multiplied by the daily rate, whichever is less.

10.4.5.4 Between 40 hours and 176 hours of actual use: The monthly rate or the product of the hours of actual use divided by 40 multiplied by the weekly rate, whichever is less.

10.4.5.5 Over 176 hours of actual use: The product of the hours of actual use divided by 176 multiplied by the monthly rate.

10.4.5.6 Operating costs including fuel, lubricants, other operating expendables, and preventive and field maintenance. Operating costs do not include the operator's wages. Contractor shall be reimbursed the product of the hours of actual use multiplied by the estimated operating cost per hour.

10.4.5.7 The geographic area adjustment factor and the Rate adjustment tables for federal aid projects shall be applied to the equipment ownership rates.

10.4.5.8 The rates used shall be those in effect at the time the Work involved is to be done as listed in the then current Rental Rate Blue Book.

10.4.5.9 In the event that a rate is not established in the Rental Rate Blue Book for a particular piece of equipment, Department will establish rates for ownership and operating costs.

10.4.5.10 Equipment to be used by Contractor shall be specifically described by manufacturer and model number and be of suitable size and capacity to accomplish the Work involved. In the event Contractor elects to use equipment of a higher rental rate than equipment suitable for the Work involved, payment will be made at the rate applicable to the suitable equipment. Department and Engineer shall determine the suitability of the equipment. If there is a differential in the rate of pay of the operator of oversized or higher rate equipment, the rate paid for the operator will likewise be related to the suitable equipment.

10.4.5.11 Transportation, loading and unloading, installation, dismantling and removal costs shall be included only if such construction equipment and machinery is imported to the site solely to perform the Work involved in the Change Order Proposed Change Order, or Claim. All equipment costs shall cease when the use thereof is no longer necessary to perform the Work involved or the equipment cannot be used to perform the Work involved due to contractor actions or inactions. Payroll costs for employees operating the equipment shall be in accordance with paragraph 10.4.1 of the General Conditions.

10.4.5.12 Actual equipment use time documented by Engineer shall be on the basis that the equipment was on and used at the site. In addition to the leasing rate, equipment operational costs shall not exceed the estimated hourly operation rate as set forth in the Blue Book. Daily records listing the equipment units and their respective operators, identification code, and actual usage and certified at the end of each day by Engineer shall be the record upon which actual equipment use shall be based. For multiple shift work sequences the allowable equipment rate for second or third shifts shall not exceed 50 percent of the base rate. Idle equipment at the site and necessary to perform the Work involved but not in actual use shall be paid at the rate determined above. Idle time shall include a reasonable time allowance to and from the site, and be as documented by Engineer.

10.4.6 Costs of Contractor rented equipment.

10.4.6.1 In the event Contractor must rent a specific piece of equipment, payment will be the actual rental rate for the piece of equipment for the time that is is used on the Work involved or required by Department to be present, not to exceed the rental rate in the Rental Rate Blue Book, plus the reasonable cost of moving the equipment onto and away from the site of the Work involved.

10.4.6.2 Contractor shall also be reimbursed for the operating cost of the rented equipment if that cost is not included in the rental cost. The operating cost shall be determined in the same manner as specified for Contractor owned equipment above. If contractor owned equipment is available on site to complete the work, Contractor shall be reimbursed only at the rate for owned equipment and there shall not be any reimbursement for transportation of equipment to or from site.

10.4.6.3 In the event area practice dictates the rental of fully manned or fueled and maintained equipment, payment will be made on the basis of an invoice for the rental of the fully manned, fueled and/or maintained equipment, including all costs incidental to its use, plus costs of moving to and from the site of the Work involved, provided the rate is substantiated by area practice.

10.4.6.4 Transportation, loading and unloading, installation, dismantling and removal costs shall be included only if such construction equipment and machinery is imported to the site solely to perform the Work involved in the Change Order, Proposed Change Order, or Claim. All equipment costs shall cease when the use thereof is no longer necessary to perform the Work involved or the equipment cannot be used to perform the Work involved due to Contractor actions or inactions. Payroll costs for employees operating the equipment shall be in accordance with paragraph 10.4.1 of the General Conditions.

10.4.7 The maximum amount of reimbursement for the ownership costs of Contractor owned equipment or for the rental costs of rented equipment shall be limited to the original purchase price of the equipment as listed in the Green Guide for Construction Equipment published by the Equipment Guide Book Company. In the specific event where the reimbursement is limited by the original purchase price, Contractor shall be reimbursed for the operating cost per hour for each hour of actual use.

10.4.8 Supplemental costs due solely in connection with the Work involved to include the following:

10.4.8.1 The necessary transportation, travel and subsistence expenses of Contractor's employees who are solely employed in the Work involved.

10.4.8.2 Costs, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office and temporary facilities at the site required, but excluding hand tools, protective clothing and other consumables which are used or consumed in connection with the Work involved and are individually valued at less than $100.00.

10.4.8.3 Sales, consumer use, or similar taxes for which Contractor is liable, exclusive of New York State and local sales taxes for materials, supplies and equipment incorporated into the Work.

10.4.8.4 Royalty payments and fees for licenses and permits.

10.4.8.5 Costs of utilities at the site including but not limited to electricity, telephone, fuel, heat, water, property rental and sanitary facilities.

10.5 The amount of credit to be allowed by Contractor to Department for any individual change in the Work which results in a net decrease in cost shall be the amount of the actual net decrease plus a deduction in Contractor's fee equal to one half of the fee derived from the application of paragraphs 10.7.2.1, 10.7.2.2 and 10.7.2.3 of this Article.

10.5.1 When more than one individual change is covered by one Proposed Change Order or Change Order, the adjustment in Contractor's fee shall be the sum of the individual fees computed on each individual change in accordance with paragraphs 10.7.2.1 through 10.7.2.4.

10.6 The cost of the Work involved shall not include any of the following, all of which are to be considered general and overhead costs covered by the Contractor's fee:

10.6.1 Payroll costs and other compensation of Contractor's executives, principals (of partnership and sole proprietorships), general managers, engineers, architects, estimators, attorneys, superintendents, administrators, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks and other personnel employed by Contractor, at the site or not, for general administration of the Work including any Change Orders, and who are not specifically included in the agreed upon schedule of job classifications referred to in paragraph 10.4.1 of this Article.

10.6.2 Expenses of Contractor's principal and branch offices other than Contractor's office at the site. Costs derived from the computation of an extended or unabsorbed home office overhead rate by application of the Eichleay, Allegheny, Burden Fluctuation, or other similar methods.

10.6.3 Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work involved and charges against Contractor for delinquent payments.

10.6.4 Cost of premiums for all bonds and insurance whether or not Contractor is required by the Contract Documents to purchase and maintain the same.

10.6.5 Costs incurred in the preparation of Proposed Change Orders or Change Orders or in preparation or filing of claims.

10.6.6 Expenses of Contractor associated with anticipated lost profits or lost revenues, lost income or earnings, lost interest on earnings or unpaid retainage.

10.6.7 Small tools used or consumed in the performance of the Work involved having an individual value of less than $100.

10.6.8 Costs due to negligence of Contractor or any subcontractor anyone directly or indirectly employed by them for whose acts any of them may be liable, including, but not limited to correction of defective work, disposal of equipment or material wrongly supplied and repairing any damage to property.

10.6.9 Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in paragraph 10.4 of this Article, all of which are to be considered general and overhead costs covered by the Contractor's fee.

Contractor's Fee:

10.7 The Contractor's fee for general and administrative overhead costs (whether at the site or in Contractor's principal or branch offices), small tools and profit on the Work involved shall be determined by negotiations in accordance with this paragraph.

10.7.1 Contractor shall negotiate with Department for reasonable overhead rates and fair and reasonable profit based on assumptions of risk, exposure to weather, size of the change, labor to material ratio, equipment requirements, and time of performance.

10.7.2 In no case shall the Contractor's fee exceed the following percentages of the various percentages of the Cost of the Work involved.

10.7.2.1 For costs incurred under paragraph 10.4.1 (Payroll Costs) of this Article, the Contractor's fee shall not exceed fifteen percent (15%).

10.7.2.2 For costs incurred under paragraph 10.4.2 (Costs of Materials and Equipment) of this Article, the Contractor's fee shall not exceed ten percent (10%).

10.7.2.3 For costs incurred under paragraph 10.4.3 (Cost of Subcontracts) of this Article, the Contractor's fee shall not exceed five percent (5%) and the subcontractor's fee shall not exceed ten percent (10%).

10.7.2.4 For costs incurred under paragraph 10.4.3 of this Article, for work performed by a subcontractor's subcontractor, the Contractor's and the first subcontractor's fees shall not exceed five percent (5%) each and the second subcontractor's fee shall not exceed ten percent (10%).

10.7.2.5 No fee shall be paid on the costs itemized under paragraphs 10.4.4 and 10.4.5 nor on subcontractors' fees derived in accordance with paragraphs 10.7.2.3 and 10.7.2.4.

10.7.3 No fee shall be paid on premium portion of wages nor on increased wages due to delays.

10.8 Changes in the Contract Price due to changes in the Contract Time.

10.8.1 An increase in the Contract Price due solely to delays causing extensions in the Contract Time will be allowed only if the delays to the Work, or parts thereof, arise from acts or omissions of Department or Engineer which are longer than the time period(s) provided for review(s) or decision(s) as provided for in the Contract Documents, and provided further that the delays arise from changes in the Work covered by Proposed Change Orders or Change Orders prepared pursuant to Article 9 of the General Conditions or from suspensions of Work pursuant to paragraph 14.1 of the General Conditions. However no adjustment in the Contract Price shall be made under this paragraph for the following reasons:

10.8.1.1 For any extensions granted in the Contract Time to the extent that performance would have been so extended by any other cause including fault or negligence of Contractor or subcontractors, suppliers or other persons or organizations.

10.8.1.2 For any acceleration alternative in lieu of an extension proposed by Contractor, to the extent that the acceleration costs exceed those in connection with the alternative extension in Contract Time.

10.8.1.3 For which a Contract Price is provided or excluded under any other provision of the Contract Documents.

10.8.1.4 For delays which are covered by or which could be covered by relocating the Total Float or a portion of it.

10.8.2 Recovery of damages for delay on account of extensions in Contractor's Progress Schedule or in connection with acceleration alternatives thereof will be allowed only when said delays extend the Work, or a part thereof, beyond the applicable Contract Time(s).

10.8.3 It is further expressly agreed and understood that Contractor will not be entitled to any compensation or damages on account of delays which meet the requirements of paragraph 10.12.3 of the General Conditions for time extensions but which can or could have been avoided by reallocating portions of the Total Float. Under this requirement, it is further understood and agreed that the only remedies for delays which are figured to cause an extension in the Contract Time or form the basis for a proposal for an acceleration alternative thereof solely due to the use of Total Float will consist of an increase in Contract Time only and shall exclude Contractor's right to recover any delay damages or compensation from Department.

10.9 In submitting proposals or asserting claims for changes under this Article, Contractor acknowledges and agrees that no adjustment shall be made: 1) for any escalation costs for any part of the Work which is not delayed beyond the applicable latest possible dates specified in the approved Progress Schedule, or 2) for any acceleration costs incurred without prior authorization from Department, or 3) for which an adjustment has been provided for, limited as to extent, or excluded under any other provision of the Contract Documents.

10.10 Contractor quotations substantiating the amount or extent of any proposed adjustment in Contract Price or Contract Time shall cover all known amounts or extents (direct, indirect and overhead) to which Contractor is entitled as a result of the proposed change. Pursuant to this requirement, Contractor acknowledges and agrees to the following waivers when executing Proposed Change Orders and Change Orders authorized in accordance with Article 9:

10.10.1 Contractor acknowledges and agrees that the adjustments in Contract Price and Contract Time stipulated in the Change Order represent full compensation for all increases or decreases in the cost of, or the time required to perform, the entire Work under the Contract arising directly or indirectly from the Change Order. Acceptance of this waiver constitutes an agreement between Contractor and Department that the Change Order represents an all inclusive, mutually agreed upon, adjustment to the Contract for all direct, indirect and consequential costs and delays, and that Contractor will waive all rights to file a claim on the Change Order after it is duly executed.

10.10.2 Acceptance by Contractor is evidence of mutual accord and satisfaction for those adjustments in the Contract Price and Contract Time stipulated in the Proposed Change Order, that Contractor will submit detailed supporting data within fifteen days in accordance with Articles 10 and 11 of the General Conditions to allow negotiation of outstanding issues, and that the changes ordered and documented by the Proposed Change Order will be incorporated into a future Change Order subsequent to agreement on all outstanding issues.

10.11 Additional costs incurred due to acceleration or additional work performed by Contractor without an agreed upon Proposed Change Order will not entitle Contractor to an increase in Contract Price or Contract Time, except in the case of emergency work as provided in paragraph 5.23 of the General Conditions or in the case of uncovering Work as provided in paragraph 12.9 of the General Conditions.

10.12 The Contract Time may be changed only by a duly executed Change order. Any proposal for an extension or shortening of the Contract Time shall be based on a Proposed Change Order in accordance with the provisions of this Article.

10.12.1 Contractor requests substantiating the extent of increase in the Contract Time shall be delivered to Engineer within fifteen days of the event causing the proposed need for the extension in the Contract Time unless Department, in writing, allows an additional period of time. Contractor

shall prove that the delays have materialized or will materialize despite reasonable, prudent, and diligent efforts to prevent such delays and meet the criteria set forth in this Article. Any delays by Contractor in submittal of proposals will not justify a delay or be basis for an extension of the Contract Time.

10.12.2 Extensions in Contract Time due to delays to parts of the Work will not be granted until all Total Float available for those parts of the Work has been used.

10.12.3 An extension in the Contract Time will not be granted unless Contractor can demonstrate, through an analysis of the Progress Schedule approved in accordance with the applicable provisions of the Standard Specifications, that the delay in completing the applicable parts of the Work within the applicable Contract Time(s) arises from unforeseeable causes beyond the control and without the fault or negligence of Contractor or its Subcontractors, Suppliers or other persons or organizations, and which Contractor could not have guarded against, and that such causes do or will cause extension of the schedule for that part of the Work beyond the applicable Contract Time. Examples of such causes include 1) acts of God or of the public enemy, 2) fires, floods, epidemics, quarantine restrictions, 3) strikes, freight embargoes, 4) unusually severe weather, 5) delays of Subcontractors or Suppliers at any tier arising from unforeseeable causes beyond the control and without fault or negligence of both Contractor and the Subcontractors, Suppliers or other persons organizations.

10.12.4 All time limits stated in the Contract Documents are of the essence. They have been developed by taking into account:

10.12.4.1 The scope of the Work under the Contract Documents;

10.12.4.2 Reasonable time for performance of the Work, or parts thereof, as a whole; and

10.12.4.3 The perceived sensitivity of the Work, or parts thereof, as a whole, to the potential delaying effect of causes meeting the requirements of paragraph 10.12.3.

10.12.4.4 Therefore, and as long as delays meeting the requirements of paragraph 10.12.3 are not to be considered by Contractor in the initial development of the Progress Schedule pursuant to paragraph 1.6 of the General Conditions and the Progress Schedule Section of the Standard Specifications, the initial Progress Schedule developed by Contractor could show Total Float with respect to the Contract Time, or contract Times. Pursuant to the Float sharing requirements of the Contract Documents (as set forth in the provisions of Progress Schedule Section of the Standard Specifications) any such Total Float materializing between Contractor's completion of the Work, or part thereof, as anticipated by Contractor's approved progress Schedule, and the corresponding Contract Time(s) will be available to Department**,** Engineer**,** Contractor and others to absorb delays that cannot be mitigated by any other means.

10.12.5 The provisions of Section 10.11 of this Article shall govern and be applicable to the following:

10.12.5.1 Changes in Contract Time initiated by Department or Contractor due to delays which meet the requirements of paragraph 10.12.4.

10.12.5.2 Contractor proposals to accelerate the Progress Schedule, in lieu of the alternate extension of Contract Time, due to delays meeting the requirements of paragraph 10.12.3.

10.12.6 The provisions of paragraphs 10.11, 10.12.2, and 10.12.3 shall exclude recovery for damages arising out of an acceleration alternative to an extension in Contract Time on account of delays not meeting the requirements for extensions in Contract Time set forth in this Article.

10.12.7 The provisions of this Article 10 shall not exclude recovery for damages (including compensation for additional professional services and court costs) for delay by either party, except as otherwise specifically disallowed in this Article and in other provisions of the Contract Documents.

10.13 Failure, refusal or neglect by Contractor to comply with the time requirements for delivery of written Proposed Change Orders or notice of a claim shall be considered to be a waiver by Contractor of any request or claiming for extension in Contract Time.

10.13.1 Contractor proposals (or claims) substantiating Contractor's proposed adjustment in Contract Price shall be delivered within the time period stipulated in paragraph 9.3 and 9.4, unless Department in writing, allows an additional period of time to ascertain accurate cost data. Contractor shall prove that additional costs were necessarily incurred, despite Contractor's reasonable, prudent, and diligent efforts to prevent such costs and which meet the criteria set forth in this Article. Any delays in the submittal of Contractor proposals relative to adjustments in Contract Price will not justify a delay or constitute basis for an increase in Contract Price or an extension in Contract Time.

10.13.2 Contractor proposals (or claims) shall be submitted on forms required by Contract Documents, and shall remain firm for a period of at least 60 days from delivery of the proposal (or claim). Proposals (or claims) shall include itemized estimates of all costs and schedule adjustments that will result directly or indirectly from the changes described. Unless otherwise specified, itemized estimates shall be in accordance with the requirements of this Article of the General Conditions and in sufficient detail to reasonably permit an analysis by Engineer and Department of all quantities involved, labor and payroll costs, productivity rates, material costs, Subcontractor and Supplier costs, supplemental costs as described in paragraph 10.4.8, special consultant costs as described in paragraph 10.4.4, equipment costs, general and administrative overhead costs, field office overhead costs, and profit and shall cover all aspects of the Work involved in the change, whether such was deleted, added, changed, or impacted. Any amount claimed for Subcontractors, Suppliers or other persons or organizations shall be similarly supported. Itemized schedule adjustments shall be sufficiently detailed to permit an analysis of effects on the Progress Schedule as required in the Standard Specifications.

ARTICLE 11 - Unit Price Work and Cash Allowances

Cash Allowances:

11.1 Contractor shall include in the Contract Price all cash allowances named in the Contract Documents and all Work covered by those cash allowances shall be performed for an amount not to exceed those allowances without prior approval in writing by Engineer.

11.1.1 The allowances include the cost to Contractor (less any applicable trade discounts) of materials labor and equipment required by the allowances to be delivered at the site, and all applicable taxes; and the cost documentation requirements of Articles 9, 10, 11 apply to cash allowances.

11.1.2 Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

Unit Price Work:

11.2 Where the Contract Documents provide that all or part of the Work to be performed on the basis of Unit Prices, the following shall apply:

11.2.1 The original Contract Price shall include the sum of the bid unit prices for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated on the Contract Bid Form.

11.2.2 Unless otherwise provided by the Contract Documents, the estimated quantities of Unit Price Work are not guaranteed and are solely for the purpose of comparing Bids and determining the initial Contract Price.

11.2.3 Engineer shall determine the actual quantities and classifications of Unit Price Work performed by Contractor and will review with Contractor preliminary determinations before recommending an Application for Payment for those items.

11.2.4 Contractor shall have included overhead and profit in the price of each separately stated unit price item bid.

11.2.5 The Unit price of an item of Unit Price Work shall be subject to re-evaluation, negotiation, and possible adjustment under the following conditions:

11.2.5.1 If the total cost of a particular item of Unit Price Work change by $30,000 or 5% or more of the total Contract Price, whichever is less, and the variation in the quantity of that particular item of Unit Price Work performed by Contractor differs by more than 15% from the estimated quantity of such item indicated in the Agreement; and

11.2.5.2 If Contractor justifies and adequately documents to the Department's satisfaction additional expenses have been incurred as a result thereof, or

11.2.5.3 If Department believes that the quantity variation entitles Department to an adjustment in the Unit Price,

Either Department or Contractor may make a request for an adjustment in the Contract Price in accordance with the Contract Documents. If the parties are unable to agree as to the effect of any such variations in the quantity of Unit Price Work performed, a claim may be made.

11.2.6 The negotiated Unit Price shall be applicable only to the variation in quantities above 115% or below 85% of the quantities estimated or indicated.

11.2.7 If Department or Contractor believes that the quantity variation requires an extension or shortening in Contract Time, either party shall within seven working days of knowledge of the variation in quantities, submit a written Proposed Change Order to the other party and to

Engineer, and substantiate the request within fifteen days thereafter in accordance with the analysis and documentation provisions of the Standard and Supplementary Specifications.

ARTICLE 12 - Warranty and Guarantee; Tests and Inspections; Correction, Removal or Acceptance of Defective Work

Warranty and Guarantee:

12.1 Contractor warrants and guarantees to Department that all Work shall be in accordance with the Contract Documents and shall not be defective. Immediate notice of all defects shall be given to Contractor by Engineer. All defective Work, whether or not in place, may be rejected, corrected or accepted as provided in this Article.

12.1.1 The obligations of Contractor under this paragraph 12.1 shall be in addition to and not in limitation of any obligation imposed upon it by special guarantees required by the Contract Documents or by Law.

12.1.2 Notwithstanding anything in these Contract Documents to the contrary, when a particular item of equipment or part of the Work reaches Substantial Completion upon successful performance of Pre-operational Testing, and a) is not placed in continuous service until the commencement of the Correction Period, or b) is placed in continuous service upon reaching Substantial Completion (as a segment of a completed Project) but use will be limited until all segments of the Project reach substantial completion thereby commencing the Correction Period, and notwithstanding anything in the Contract Documents to the contrary, Contractor shall maintain the particular item of equipment or part of the Work in good order and in proper working condition during the period between the particular Substantial Completion date and the commencement of the Correction Period, and for such maintenance Contractor shall receive no adjustment in Contract Price. Also Contractor shall maintain the warrantees and guarantees required under paragraph 12.1 of the General Conditions in full force and effect during the period between the particular item's Substantial Completion date and the commencement of the Correction Period, and for such warranties and guarantees Contractor shall receive no adjustment in Contract Price.

12.1.3 The warrantees and guarantees provided by Contractor under paragraph 12.1 of the General Conditions shall remain in full force and effect from the date of Substantial Completion of the Work, or part thereof, until one year after the date of commencement of the Correction Period or such a longer period as may be prescribed by Law or the terms of any applicable specific warranty or guarantee required by the Contract Documents or by any specific provision of the Contract Documents.

One Year Correction Period:

12.2 If within the period from the date of Substantial Completion of a particular item of equipment or a designated part of the Work to one year after the commencement of the Correction Period, or such longer period as may be prescribed by Federal or New York State Law or by the terms of any applicable special guarantee required by the Contract Documents or by any specific provision of the Contract Documents, the particular item of equipment or designated part of the Work is found to be defective, Contractor shall promptly, without an adjustment in Contract Price and in accordance with Department's or Engineer's written instructions, either correct such Defective Work, or if it has been rejected by Department or Engineer, remove it from the site and replace it with Work which conforms to the requirements of the

Contract Documents. Department or Engineer may direct the correction or removal and replacement of Defective or rejected Work. In addition to any other remedies which Department may have, Contractor shall pay the indirect and consequential costs of such correction or removal and replacement, including but not limited to fees and charges of engineers, architects, attorneys and other professionals, any additional expenses incurred by Department due to delays to others performing work under a separate contract with Department, and other contractual obligations, if the Defective Work is not corrected or the rejected Work is not removed and replaced within 30 days of the Department's or Engineer's written rejection or request for rejection of Work unless otherwise provided for in writing. In the event that Contractor fails to pay such costs within thirty days after receipt of an invoice from Department, a Change Order or Proposed Change Order may be issued incorporating the unpaid amount, and Department shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, a claim may be made therefore as provided in Articles 8, 9 and 10 of the General Conditions.

12.2.1 At the date of Substantial Completion of the Work, the parties have agreed on the date for commencement of the Correction Period. However, Department may at its sole option advance or delay the date for commencement of the Correction Period, and Contractor's obligations to extend warranties and guarantees in accordance with paragraphs 12.1.2 and 12.1.3 or to maintain the Work in accordance with paragraph 12.1.2 and 12.1.3 until then shall remain absolute. Applicable Change Orders or Proposed Change Orders shall be executed by the parties to adjust the Contract Price, as appropriate, on the basis of the unit prices declared in Contractor's Bid for extended warranty and extended maintenance requirements.

12.2.2 No later than 30 days before the date for commencement of the Correction Period, Engineer shall notify Contractor in writing of the date upon which the Correction Period is expected to commence, and Contractor shall ensure that the parts of the Work which reached Substantial Completion upon successful performance of Pre-operational Testing but were not placed in continuous service, are ready in their entirety by such date for use by Department as contemplated in the Contract Documents. In addition to any other damages payable by Contractor under these Contract Documents, Contractor shall also be liable for any damages suffered by Department on account of the parts of the Work which reached Substantial Completion upon successful performance of Pre-operational Testing but were not placed in continuous service at the beginning of the Correction Period because they were not ready for continuous utilization for the purposes for which they are intended.

12.2.3 Each month during the period between the date of Substantial Completion of parts of the Work which reached Substantial Completion upon successful performance of Pre-operational Testing and the date of commencement of the Correction Period, Contractor shall certify to Engineer in writing that the said parts of the Work are being properly maintained and will be ready for use by Department upon commencement of the Correction Period.

12.2.4 During the period described in Section 12.2.3 until commencement of the Correction Period, Contractor shall bear all risks of injury, loss, or damage to any part of the Work arising from the elements or from any other cause. Contractor shall rebuild, repair, restore, and make good at no cost to Department all injuries, losses, or damage to any portion of the Work occasioned by any cause and shall at no expense to Department provide suitable drainage and erect such temporary structures and take all other actions as are necessary for the protection of the Work. Suspension of the Work or the granting of an extension in Contract Time for any cause shall not relieve Contractor of its responsibility for the Work as herein specified.

12.2.5 Contractor's responsibilities under this Paragraph 12.2 are in addition to, not in lieu of, all other obligations imposed by these Contract Documents.

Access to Work:

12.3 Representatives of Department, Engineer, and representatives of testing agencies and governmental agencies with jurisdictional interests will have access to the Work at all times for observation, inspection and testing. Contractor shall provide proper and safe conditions for such access. Inspections, tests or observations by Engineer, Department or third parties may be performed to provide information to Department on the progress of the Work, however, this provision is not intended to create any duty or obligation to Contractor by Department or Engineer, nor is the information provided intended to fulfill Contractor's obligations under the Contract.

Tests and Inspections:

12.4 Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests or approvals.

12.5 If a Law specifically requires any Work (or part thereof) to be inspected, tested or approved, Contractor shall assume full responsibility therefor, pay all costs in connection therewith and furnish to Engineer the required certificates of inspection, testing or approval. Except as provided in Article 5, Contractor shall be responsible for and shall pay all costs in connection with any inspection or testing required in connection with Department's or Engineer's acceptance of materials or equipment proposed or submitted to Department and Engineer for approval prior or subsequent to Contractor's purchase thereof for incorporation in the work. The cost of all inspections, tests and approvals in addition to the above which are required by the contract documents shall be paid by Contractor.

12.6 All inspections, tests or approvals other than those required by Law to be performed or given by public body having jurisdiction over the Work or any part thereof, shall be performed by organizations acceptable to Department and Engineer. Contractor shall perform sufficient inspection and testing of the Work to support the warranty and guarantee requirements of paragraph 12.1 and 12.2 of the General Conditions. Reference is made to the Supplementary Conditions, Standard Specifications and Supplementary Specifications for provisions applicable to the procurement of an independent testing laboratory.

12.7 If any Work, including the work of others, that is to be inspected, tested or approved is covered without written concurrence of Engineer, it must, if requested by Engineer, be uncovered for inspection. Such uncovering shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

12.8 Neither inspections by Engineer nor inspections, tests or approvals by others shall relieve Contractor from Contractor's obligations to perform the Work in accordance with the Contract Documents.

Uncovering Work:

12.9 If any work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's inspection and replaced at Contractor's expense.

12.10 If Engineer considers it necessary or advisable that covered Work be inspected by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose or otherwise make available for observation, inspection or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material and equipment.

12.10.1 If it is found that such Work is Defective, Contractor shall bear all direct, indirect and consequential costs of such uncovering, exposure, observation, inspection and testing, and of satisfactory reconstruction, including but not limited to fees and charges of engineers, architects, attorneys and other professionals, any additional expenses incurred by Department due to delays to others performing work under a separate contract with Department, and other contractual obligations, Contractor shall further bear the responsibility for keeping the Work on schedule and shall not be entitled to any extension of Contract Time or recovery of any delay damages due to the uncovering.

12.10.2 If, however, such Work is not found to be Defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction pursuant to Articles 9, 10 and 11.

12.10.3 When covered Work is uncovered and found to be Defective, all direct, indirect and consequential costs as established in paragraph 12.10.1 shall be paid by Contractor. In the event that Contractor fails to pay such costs within thirty days after receipt of an invoice from Department, a Change Order or Proposed Change Order may be issued incorporating the unpaid amount as an appropriate reduction in the Contract Price, and if the parties are unable to agree as to the amount thereof, the Contractor may make a claim therefore as provided in Articles 9 and 10 of the General Conditions.

Department May Stop the Work:

12.11 If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to furnish or perform the Work in such a way that the completed Work will conform to the Contract Documents, Department may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Department to stop the Work shall not give rise to any duty on the part of Department to exercise this right for the benefit of Contractor or any other party.

12.11.1 Contractor shall bear all direct, indirect and consequential costs of such order to Contractor to stop Work including but not limited to fees and charges of engineers, architects, attorneys and other professionals, any additional expenses incurred by Department due to delays to others performing work under a separate contract with Department, and other contractual obligations, and Contractor shall further bear the responsibility for maintaining schedule and shall not be entitled to any extension of contract time or recovery of any delay damages due to the order to stop Work.

12.11.2 In the event that Contractor fails to pay such costs within thirty days after receipt of an invoice from Department, a Change Order or Proposed Change Order may be issued incorporating the unpaid amount as an appropriate reduction in the Contract Price. If the parties are unable to agree as to the amount thereof, the Contractor may make a claim therefore as provided in Articles 8, 9, 10, and 11 of the General Conditions.

Correction or Removal of Defective Work:

12.12 If required by Engineer, Contractor shall promptly, as directed, either correct all defective Work, whether or not fabricated, installed or completed, or, if the Work has been rejected by Engineer, remove it from the site and replace it with non-defective Work that conforms with the Contract Documents. Contractor shall bear all direct, indirect and consequential costs of such correction or removal including but not limited to fees and charges of engineers, architects, attorneys and other professionals, any additional expenses incurred by Department due to delays to others performing work under a separate contract with Department, and other contractual obligations. Contractor shall further bear the responsibility for keeping the Work on schedule and shall not be entitled to any extension in Contract Time or recovery of any delay damages due to the correction or removal. In the event that Contractor fails to pay such costs within thirty days after receipt of an invoice from Department, a Change Order or Proposed Change Order may be issued incorporating the unpaid amount, as an appropriate reduction in the Contract Price. If the parties are unable to agree as to the amount thereof, the Contractor may make a claim therefore as provided in Articles 8, 9, 10, and 11 of the General Conditions.

Acceptance of Defective Work:

12.13 If, instead of requiring correction or removal and replacement of defective Work, Department prefers to accept it, Department may do so. Contractor shall bear all direct, indirect and consequential costs attributable to Department's evaluation and determination to accept such Defective Work, such costs to include but not be limited to fees and charges of engineers, architects, attorneys and other professionals, any additional expenses incurred by Department due to delays to others performing work under a separate contract with Department, and other contractual obligations. Contractor shall further bear the responsibility for keeping the Work on schedule and shall not be entitled to any extension in Contract Time or recovery of any delay or acceleration damages due to Department's evaluation and determination to accept such Defective Work. If any such acceptance occurs prior to Engineer's recommendation of final payment, a Change Order may be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Department shall be entitled to an appropriate reduction in the Contract Price. In the event that Contractor fails to pay such costs within thirty days after receipt of an invoice from Department, or if the parties are unable to agree as to the amount thereof, Contractor may make a claim therefore as provided in Articles 8, 9, 10, and 11 of the General Conditions. If the acceptance occurs after final payment, an appropriate amount will be refunded by Contractor to Department.

Department May Correct Defective Work:

12.14 If Contractor fails within a reasonable time after written notice of Engineer to proceed to correct and to correct Defective Work or to remove and replace rejected Work as required by Engineer, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Department may, after seven days' written notice to Contractor, correct and remedy any such deficiency. To the extent necessary to complete corrective and remedial action, Department may exclude Contractor from all or part of the site, take possession of all or part of the work and suspend or terminate Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the site and incorporate in the Work all materials and equipment stored at the site or for which Department has paid Contractor but which are stored elsewhere. Contractor shall allow Department, and Department's representatives, agents and employees such access to the site as may be necessary to enable Department to exercise the rights and remedies provided by this paragraph and the Contract Documents. All direct, indirect and consequential costs of Department in exercising such rights and remedies will be charged against Contractor in an

amount approved as to reasonableness by Engineer, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Department shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Contractor may make a claim therefore as provided in Article 8, 9, 10, and 11. Such direct, indirect and consequential costs shall include but not be limited to fees and charges of engineers, architects, attorneys and other professionals, all costs of delay and all costs of repair and replacement of work of others destroyed or damaged by correction, removal or replacement of Contractor's Defective Work. Contractor shall not be allowed an extension of the Contract Time because of any delay in performance of the Work attributable to the exercise by Department of Department's rights and remedies hereunder.

ARTICLE 13 - Payments to Contractor and Completion

Schedule of Values:

13.1 The schedule of values established as provided in paragraph 1.4 and 1.6 of the General Conditions shall serve as the basis for progress payments. Progress payments for Unit Price Work shall be based on the number of units completed. Department will furnish Application for Payment forms.

Application for Progress Payment:

13.2 At least fourteen days before each progress payment is scheduled to be submitted to the Department, Contractor shall submit to Engineer for review an Application for Payment on forms furnished by Department filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the site or at another location agreed to in writing, the Application for Payment shall also be accompanied by bills of sale, invoices or other documentation supporting the cost, together with documents warranting that Department has received the materials and equipment free and clear of all liens, charges, security interests and encumbrances (each and all of these terms are hereinafter referred to as "Liens"). Each Application for Payment shall contain a certification by Contractor that progress payments received from Department on account of the Work have been applied by Contractor and its Subcontractors to discharge in full all of Contractor's and its Subcontractors' obligations stated in the prior Application for Payment, and that Contractor has verified the accuracy of the progress reported to have been completed by Contractor or its Subcontractors in the Application for Payment. Notwithstanding any other provisions of the Contract Documents to the contrary, neither Department nor Engineer are under any duty or obligation whatsoever to any Subcontractor or Supplier to insure that payments due and owing by Contractor to any of them are or will be made. Such parties shall rely only on Contractor's surety bonds for remedy of nonpayment by Contractor. The amount of retainage with respect to progress payments will be as provided for by the laws of New York State.

13.2.1 An Application for Payment a) will not be approved if the as-built documents, including but not limited to Drawings legibly marked in accordance with Contract Documents to record actual construction, are not kept current, and b) will not be approved until the completed as-built documents, showing all variations between the Work as actually constructed and as originally shown on the Drawings and other Contract Documents, have been inspected by Engineer. For the purpose of this paragraph, the as-built documents will be considered current if they include all of the documents itemized in paragraph 5.19 together with any other information that supplements or changes the original Contract Documents which has been delivered or

otherwise made known to Contractor prior to the time when Application for Payment is to be reviewed by Engineer.

13.2.2 An Application for Payment will not be approved until Contractor has submitted and Engineer has reviewed the Progress Schedule and submittals required in Contract Documents which are due prior to that Application for Payment.

Contractor's Warranty of Title:

13.3 Contractor warrants and guarantees that title to all Work, materials and equipment covered by any Application for Payment, whether or not incorporated in the Project, shall pass to Department no later than the time of payment free and clear of all Liens.

Review of Applications for Progress Payment:

13.4 Engineer shall, within five days after receipt of each Application for Payment, either recommend payment in writing and present the Application to Department or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the application. After presentation of the application for payment with Engineer's recommendation, the amount recommended shall be paid in accordance with New York State Law upon approval of the Department.

13.5 Department may refuse to make payment of the full amount recommended by Engineer for one or more of the following reasons: claims have been made against Department on account of Contractor's performance, or furnishing of the Work, Liens have been filed in connection with the Work, there are other facts or circumstances entitling Department to a set-off against the amount recommended, or Department has determined that Work performed by Contractor does not conform to Contract Documents including, but not limited to, moneys payable by Contractor to Department pursuant to the requirements of Articles 5 and 12 of the General Conditions. In the event of such refusal to pay the full recommended amount, Department must give Contractor prompt written notice (with a copy to Engineer) stating the reasons for such action.

Substantial Completion:

13.6 When Contractor considers all or part of the Work ready for its intended use, Contractor shall notify Department and Engineer in writing that the Work or specified part thereof, is substantially complete except for items specifically listed by Contractor as incomplete, and request that Engineer issue a certificate of Substantial Completion for the Work, or such specified part thereof. Within a reasonable time thereafter, not to exceed 30 days, Department, Contractor and Engineer shall make an inspection of the Work, or specified part thereof, to determine the status of completion. If Engineer or Department does not consider the Work, or specified part thereof, substantially complete, Engineer shall notify Contractor in writing giving the reasons therefor, after consultation with the Department. If Engineer considers the Work, or part thereof, substantially complete, Engineer shall prepare and deliver to Department a tentative certificate of Substantial Completion for the Work, or part thereof which shall fix the date of Substantial Completion. There shall be attached to the certificate a list of items to be completed or corrected before final payment, and Engineer's written recommendation as to a division of responsibilities between Department and Contractor pending final payment including but not limited to security, operation, safety, maintenance, heat, utilities, insurance and warranties. Department shall have seven days after receipt of the tentative certificate with attachments during which to make written objection to Engineer as to any provisions of the referenced submittals and to direct a revision of the

tentative certificate. Unless Department and Contractor agree otherwise in writing and so inform Engineer or Department directs the revision of the certificate of Substantial Completion for the Work, or specified part thereof, Engineer's recommendation will be binding on Contractor until final payment.

13.7 Department shall have the right to exclude Contractor from the Work, or part thereof, after the date of Substantial Completion for the Work, but Department shall allow Contractor reasonable access to complete or correct items on the tentative list.

Partial Utilization:

13.8 Department may use any finished part of the Work which has specifically been identified in the Contract Documents, or which Department, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Department without significant interference with Contractor's performance of the remainder of the Work, may be accomplished prior to Substantial Completion of all the Work subject to the following:

13.8.1 Department at any time may direct Contractor in writing to permit Department to use any such part of the Work which Department believes to be ready for its intended use and substantially complete. Contractor may certify to Department and Engineer that said part of the Work is substantially complete and request Engineer to issue certificate of Substantial Completion for that part of the Work. Within a reasonable time after such direction, Department, Contractor and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not determine that part of the Work to be substantially complete, Engineer will notify Department and Contractor in writing giving the reasons therefor. The provisions of paragraphs 13.6 and 13.7 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

13.8.2 Department may at any time direct Contractor in writing to permit Department to take over operation of any such part of the Work although it is not substantially complete. A copy of such request will be sent to Engineer and within a reasonable time thereafter Department, Contractor and Engineer shall make an inspection of that part of the Work to determine its status of completion and will prepare a list of the items remaining to be completed or corrected thereon before final payment. If Contractor does not object in writing to Department and Engineer that such part of the Work is not ready for separate operation by Department, Engineer shall submit to Department a list of items to be completed or corrected together with a written recommendation as to a division of responsibilities between Department and Contractor, including but not limited to security, operation, safety, maintenance, utilities, insurance and warranties pending final payment for such Work. Department shall have seven days to make written objection to Engineer's list and recommended division of responsibilities to direct a revision thereof. Such directed revision or otherwise objected list and recommended division of responsibilities, shall become binding upon Department and Contractor at the time when Department takes over such operation unless they shall have agreed otherwise in writing. During such operation and prior to Substantial Completion of such part of the Work, Department shall allow Contractor reasonable access to complete or correct items on said list and to complete other related Work.

Final Inspection:

13.9 Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will make a final inspection with Department and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to remedy such deficiencies.

Final Application for Payment:

13.10 After Contractor has completed all corrections to the satisfaction of Engineer and Department and delivered all maintenance and operating instructions, schedules, guarantees, Bonds, certificates of inspection, marked-up record documents (as provided in paragraph 5.19) and other documents - all as required by the Contract Documents, and after Engineer has indicated that the Work is acceptable (subject to the provisions of paragraph 13.12), Contractor may make application for final payment following the procedures for progress payments. The final Application for Payment shall be accompanied by all documentation called for in the Contract Documents, together with complete and legally effective releases or waivers satisfactory to Department of all Liens arising out of or filed in connection with the Work. In lieu thereof and as provided for by the laws of New York State and approved by Department, Contractor may furnish receipts or releases in full and an affidavit of Contractor that such receipts and releases include all labor, services, material and equipment for which a Lien could be filed, and that all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Department or Department's property might in any way be responsible, have been paid or otherwise satisfied; and consent of the surety, if any, to final payment. If any Subcontractor or Supplier fails to furnish a release or receipt in full, Contractor may furnish a Bond or other collateral satisfactory to Department to indemnify Department against any Lien.

Final Payment and Acceptance:

13.11 If, on the basis of Engineer's inspection of the work during construction and final inspection, and Engineer's review of the final application for payment and accompanying documentation, Engineer has determined that the work has been completed in substantial conformance with the contract documents and Contractor's other obligations under the contract documents have been fulfilled, Engineer will, within ten days after receipt of the final application for payment, indicate in writing Engineer's recommendation of payment and present the application to Department for payment along with a certificate that the work was completed in substantial conformance with the contract documents. Thereupon Engineer will give written notice to Department and Contractor that the work is acceptable subject to the provisions of paragraph 13.13. Otherwise, Engineer will return the application to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application. After presentation to Department of the application and accompanying documentation, in appropriate form and substance, and with Engineer's recommendation and certification of substantial conformance with the Contract Documents, final payment will be paid by Department to Contractor in accordance with New York State Law. If Department believes deficiencies exist, it will so notify Engineer and Contractor in writing.

13.12 If, through no fault of Contractor, final completion of the Work is significantly delayed and if Engineer so confirms, Department shall, upon receipt of Contractor's final Application for Payment and recommendation of Engineer, and without terminating the Agreement, make payment of the balance due for that portion of the Work fully completed and accepted.

Waiver of Claims:

13.13 The making and acceptance of final payment will constitute:

13.13.1 A waiver of all claims by Department against Contractor, except claims arising from unsettled Liens, from Defective Work appearing after final inspection pursuant to paragraph 13.11 or from failure to comply with the Contract Documents or the terms of any special guarantees specified therein; however, it will not constitute a waiver by Department of any claims or rights with respect to Contractor's continuing obligations under the Contract Documents; and

13.13.2 A waiver of all claims by Contractor against Department other than those previously made in writing and still unsettled.

ARTICLE 14 - Suspension of Work and Termination

Department May Suspend Work:

14.1 Department may for its convenience, order Contractor in writing at any time to suspend the Work or any portion thereof for such a period of time as Department may determine to be appropriate. A suspension of Work order will fix the date on which the Work, or portion thereof, will be resumed. Contractor shall resume the Work, or portion thereof, on the date so fixed.

14.1.1 If the performance of the Work or portion thereof is suspended for a period of time which exceeds the Total Float available in the approved Progress Schedule for the portion or portions controlling the Work affected by a suspension of Work order pursuant to paragraph 14.1, or by an act of Department or Engineer in the administration of the Contract, or by Department's or Engineer's failure to act within the applicable latest dates substantiated in the approved Progress Schedule, Contractor will be allowed an increase in Contract Price or an extension in Contract Time, or both, necessarily caused by such suspension which extends the applicable latest dates in the approved Progress Schedule. However, no adjustment will be made under this paragraph of the General Conditions for any suspension to the extent: 1) that performance would have been so suspended by any other cause, including the fault and negligence of Contractor, or 2) for which an adjustment is provided, limited as to extent, or excluded under any other provision of the Contract Documents.

14.1.2 Contractor shall deliver to Engineer a written Proposed Change Order including at a minimum, justification for the request within seven days or earlier if so required elsewhere in the Contract Documents, of the act or failure to act which Contractor believes gives rise to an adjustment in Contract Price or Contract Time pursuant to paragraph 14.1.1. Failure by Contractor to comply with the time requirements for delivery of written Proposed Change Orders will be considered to be a waiver by Contractor of any request for adjustment or claim for an increase in Contract Price or Contract Time for the period of time during which the Proposed Change Order has not been submitted.

14.1.3 Contractor's proposal with all supporting data shall be delivered within 15 days of such notice or within twenty-two days of such occurrence, whichever is later, unless Department allows an additional period of time to obtain more accurate data. Contractor shall prove that additional costs and delays were necessarily incurred which meet the criteria set forth in Articles 9, 10 and 11 of the General Conditions, despite Contractor's reasonable, prudent, and diligent efforts to prevent such costs or delays.

14.2 In addition to the provisions of Appendix B, if Department stops Work in accordance with Article 12.10 of the General Conditions or suspends Contractor's services in accordance with article 12.11, or suspends

the work or any portion thereof because of Contractor's failure to prosecute the work and to protect persons and property, Contractor shall not be entitled to an extension of Contract Time or an increase in Contract Price.

Department May Terminate:

14.3 Department may serve written notice upon Contractor and its surety that it intends to terminate the Contract for cause upon the date specified which shall not be less than seven days from the date of the notice. Such notice shall contain the reasons for the intended termination which shall be effective on the date specified unless Contractor shall cease the violations(s) or make arrangements which are satisfactory to the Department to address the violation(s). Upon termination, the Department may exclude Contractor from the site and take possession of the Work and of all Contractor's tools, appliances, construction equipment and machinery at the site and use the same to the full extent they could be used by Contractor without liability to Contractor for trespass or conversion, incorporate in the work all materials and equipment stored at the site or for which Department has paid Contractor but which are stored elsewhere, and finish the Work as Department may deem expedient. In such case Contractor shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds the direct, indirect and consequential costs of completing the Work including but not limited to fees and charges of Engineers, architects, attorneys and other professionals and court costs, such excess will be paid to Contractor. If such costs exceed such unpaid balance, Contractor shall pay the difference to Department. Such costs incurred by Department will be approved as to reasonableness by Engineer and incorporated in a Change Order or Proposed Change Order.

Department may terminate for cause upon the occurrence of any one or more of the following events:

14.3.1 If Contractor commences a voluntary case under any chapter of the Bankruptcy Code, as now or hereafter in effect, or if Contractor takes any equivalent or similar action by filing a petition or otherwise under any other federal or state law in effect at such time relating to the bankruptcy or insolvency;

14.3.2 If a petition is filed against Contractor under any chapter of the Bankruptcy Code as now or hereafter in effect at the time of filing, or if a petition is filed seeking any such equivalent or similar relief against Contractor under any other federal or state law in effect at the time relating to bankruptcy or insolvency;

14.3.3 If Contractor makes a general assignment for the benefit of creditors;

14.3.4 If a trustee, receiver, custodian or agent of Contractor is appointed under applicable law or under contract, whose appointment or authority to take charge of property of Contractor is for the purpose of enforcing a lien against such property or for the purpose of general administration of such property for the benefit of Contractor's creditors;

14.3.5 If Contractor admits in writing an inability to pay its debts generally as they become due;

14.3.6 If Contractor fails to perform the Work in accordance with the Contract Documents, including, but not limited to, failure to supply sufficient skilled workers, or suitable materials or equipment, or failure to adhere to the progress schedule established under paragraph 1.6 as revised from time to time or failure to submit an updated schedule as required by paragraph 5.6;

14.3.7 If Contractor disregards Laws or Regulations of any public body having jurisdiction;

14.3.8 If Contractor disregards the authority of Engineer;

14.3.9 If Contractor filed certification in accordance with New York State Finance Law ' 139-k which was intentionally false or intentionally incomplete; or

14.4 Where Contractor's services have been so terminated by Department, the termination shall not affect any rights or remedies of Department against Contractor then existing or which may thereafter accrue. Any retention or payment or moneys due Contractor by Department will not release Contractor from liability.

14.5 The Department may without cause and without prejudice to any other right or remedy terminate the Contract for convenience upon seven days written notice to Contractor, it's surety and Engineer, and elect to abandon the Work and terminate the Agreement. In such case, Contractor shall be paid for all Work accepted by Department.

Contractor May Stop Work or Terminate:

14.6 If, through no act or fault of Contractor, Engineer fails to act on any Application for Payment within thirty days after it is submitted, or Department fails for one hundred and twenty days to pay Contractor any sum finally determined to be due by Department, then Contractor may, upon seven days' written notice to Department and Engineer, terminate the Agreement and recover from Department payment for all Work accepted by Department. In lieu of terminating the Agreement, if Engineer has failed to act on an Application for Payment or Department has failed to make any payment as aforesaid, Contractor may upon seven days' written notice to Department and Engineer stop the Work until payment of all amounts then due. The provisions of this paragraph shall not relieve Contractor of the obligations under paragraph 5.31~~30~~ to carry on the Work in accordance with the progress schedule and without delay during disputes and disagreements with Department.

ARTICLE 15 - Miscellaneous

Notice and Service:

15.1 All notices, demands, requests, instructions, approvals and claims shall be in writing.

15.1.1 Any notice to or demand upon Contractor shall be deemed sufficient if delivered to Contractor's representative at the site or if delivered to the individual proprietor if Contractor is an individual, to a partner if Contractor is a partnership or to an officer of the corporation if Contractor is a corporation, at the office of Contractor specified in the Contract Documents, or if deposited in the United States mail in a sealed, postage prepaid envelope, addressed to the principal office of Contractor listed in the Agreement, or if delivered with charges prepaid to any telegraph company for transmission, in each case addressed to the office of Contractor specified in the Contract Documents or faxed to the number provided in the Contract Documents and followed by written notice.

15.1.2 All notices or other papers required to be delivered by Contractor to Department, or to any of its representatives shall, unless otherwise specified in writing to Contractor, be delivered to Department at the office specified in the Contract Documents. Any other notice or demand upon Department shall be deemed sufficient if delivered to such office, or if deposited in the United States mail in a sealed, postage prepaid envelope, or if delivered, with the charges

prepaid to any telegraph company for transmission, in each case addressed to such office or to such other representative of Department or to such other address as Department may subsequently specify in writing to Contractor for such purpose, or faxed to the number provided in the Contract Documents and followed by written notice.

15.1.3 Any written notice or other communication to Contractor's Surety or Sureties shall be delivered or mailed to the home office of the Surety or Sureties, or to the agent or agents who executed the Bonds on behalf of the Surety or Sureties.

15.1.4 Any such notice or demand shall be deemed to have been given or made as of the time of actual delivery, or, in the case of mailing or of telegrams, at the time of actual receipt thereof.

Computation of Time:

15.2 When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last calendar day of such period. If the last calendar day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the State of New York, such day will be omitted from the computation. This does not apply to contract completion time as set forth in Article 6 of the Agreement.

General:

15.3 Should Department or Contractor suffer injury or damage to person or property because of an act or omission to act of the other party, its employees or agents or others for whose acts the other party is legally liable, a Claim may be made therefore, in writing to the other party within a reasonable time of the first observance of such injury or damage. The provisions of this paragraph shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitations or repose.

15.4 The duties and obligations imposed by these General Conditions and the rights and remedies available to the parties hereunder, including but not limited to the warranties, guarantees and obligations imposed upon Contractor by Contract Documents and all of the rights and remedies available to Department thereunder, are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by New York State Laws, by special warranty or guarantee or by other provisions of the Contract Documents. The provisions of this paragraph shall be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right and remedy. All representations, warranties and guarantees made in the Contract Documents shall survive final payment and termination or completion of the Agreement.

15.5 The obligation of Contractor to maintain the Work, or any part thereof, until the completion of the Correction Period shall survive final payment and termination or completion of the Agreement.

No Waiver of Legal Rights:

15.6.1 Inspection by Engineer or by any of its duly authorized representatives, any measurement or report by Engineer, any order by Department for the payment of money, any payment for or acceptance or possession of any Work or any extension in Contract Time or any possession taken by Department shall not operate as a waiver of any provision of the Contract Documents, or any power therein preserved to Department, or of any right to damages therein provided.

Any Waiver of any breach of this Contract shall not be held to be a waiver of any other or subsequent breach.

15.6.2 Department reserves the right to correct any error that may be discovered in any estimate that may have been paid, and to adjust the same to meet the requirements of the Contract Documents. Department further reserves the right, should proof of Defective Work on the part of Contractor be discovered after the final payment has been made, to claim, and recover by process of law, such sums as may be sufficient to correct the error, or make good the defects in the Work.

15.6.3 Any waiver of any provision of the Contract Documents shall be specific, shall apply only to the particular item or matter concerned and shall not apply to other similar or dissimilar items or matters.

Affidavit and Release of Lien:

15.7.1 When the Work has been completed, Contractor shall execute a final release of Lien and an Affidavit declaring that all bills have been paid in full, and that the requirements of the New York State Labor Law have been complied with.

15.7.2 These documents will be furnished to Department on the forms provided by Department.

15.7.3 Contractor shall be responsible for obtaining and submitting these forms to Department for all subcontractors involved in the Work.

Recovery Rights Subsequent to Final Payment:

15.8 Department reserves the right, should an error be discovered in an Application for Payment or should proof of Defective Work or materials used by or on the part of Contractor be discovered after the final payment has been made, to claim and recover from Contractor or his Surety, or both, by process of law, such sums as may be sufficient to correct the error or make good the defects in the Work and materials.

General Guarantee:

15.9 Neither the final acceptance, nor final payment by Department, nor any provision of the Contract Documents, nor partial or entire use of the Work by Department, shall constitute an acceptance of Work not done in accordance with the Contract Documents or relieve Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship. Contractor guarantees the remedy of all Defective Work and payment for all damage to other Work, persons or property resulting therefrom which shall occur within one year from the date of final acceptance unless a longer period is required by Contract Documents, by Law, or by standard practice. Department will give notice of observed Defective Work with reasonable promptness. Contractor shall ensure that its Surety shall be bound with and for Contractor in the faithful observance of this General Guarantee.

Audit; Access to Records:

15.10.1 In addition to the rights of access set forth in Appendix A, if Contractor has submitted Cost and Pricing Data in connection with the pricing of any Change Order, Proposed Change Order or Claim related to this Contract, Department and Engineer or any of their duly authorized representatives shall have the right to examine and audit all books, ledgers, records, and

documents pertinent to all Cost and Pricing data available and relied upon by Contractor including but not limited to that used by Contractor in the determination of its Bid for the Work, in order to evaluate the accuracy, completeness, and currency of the Cost or Pricing data.

15.10.2 Contractor shall make available at Contractor's office at all reasonable times the materials described in paragraph 15.10.1 above, for examination, audit, or reproduction, until 6 years after final payment under this Contract.

15.10.2.1 If this Contract is completely or partially terminated, the records relating to the Work terminated shall be made available for 6 years after any resulting final termination settlement.

15.10.2.2 Records pertaining to appeals under Article 8 of Section VIII, "General Conditions," to litigation or the settlement of claims arising under or relating to the performance of this Contract shall be made available until disposition of such appeals, litigation, or claims.

15.10.3 A provision stating that all the requirements of this Article of Section VIII, "General Conditions" are applicable to Subcontracts under this Contract exceeding $50,000 in value shall be inserted by Contractor in all such subcontracts.

Price Reduction for Defective Cost or Pricing Data:

15.11.1 This provision shall become operative only for any Change Order, or Proposed Change Order or claim settlement under this Contract involving aggregate increases and/or decreases in costs, plus applicable profits, of more than $10,000; except that this provision shall not apply to any amendment to the Contract for which the price of the Work involved in the amendment is:

15.11.1.1 Based on adequate price competition;

15.11.1.2 Based on established catalog or market prices of commercial items sold in substantial quantities to the general public, or

15.11.1.3 Set by New York State law.

15.11.2 If any price, including profit, negotiated in connection with any Change Order, Proposed Change Order or claim settlement under this provision, was increased because: 1) Contractor or a Subcontractor, Supplier, other person or organization furnished Cost and Pricing Data that were not complete, accurate, and current as certified in its Certificate of Current Cost or Pricing Data; 2) a designated or prospective Subcontractor, Supplier, other person or organization furnished Contractor Cost and Pricing Data that were not complete, accurate, and current as certified in the Contractor's Certificate of Current Cost and Pricing Data; or 3) any of these parties furnished data of any description that were not accurate, the price shall be changed accordingly and the Contract shall be adjusted to reflect the change. This right to a change in Contract Price is limited to that resulting from defects in data relating to amendments to the Contract for which this provision becomes operative under paragraph 16.11.1 above.

15.11.3 Any decrease in Contract Price under paragraph 16.11.2 above due to defective data from a designated or prospective Subcontractor, Supplier, other person or organization that was not subsequently awarded the Subcontract or purchase order shall be limited to the amount, plus applicable overhead and profit markup, by which 1) the actual Subcontract or purchase order or

2) the actual cost to Contractor, if there was no Subcontract or purchase order, was less than the prospective Subcontract or purchase order, cost estimate submitted by Contractor; provided, that the actual Subcontract or purchase order price was not itself affected by defective cost or Pricing data.

15.11.4 Before awarding any Subcontract or purchase order which exceeds or can be reasonably expected to exceed $150,000 when entered into, or pricing any Change Order or Proposed Change Order or claim settlement involving a pricing adjustment expected to exceed $10,000, Contractor shall require the Subcontractor, Supplier, other person or organization to submit Cost or Pricing data (actually or by specific identification in writing), unless the price is:

15.11.4.1 Based on adequate price competition;

15.11.4.2 Based on established catalog or market prices of commercial items sold in substantial quantities to the general public; or

15.11.4.3 Set by New York State law.

15.11.5 Contractor shall require such Subcontractor, Supplier, other person or organization to certify in the form prescribed in the Contract Documents, that to best of its knowledge and belief, the data submitted under paragraph 15.11.4 is accurate, complete, and current as of the date of agreement on the negotiated price of the Subcontract, purchase order, Change Order, Proposed Change Order, or claim settlement affecting the Subcontract.

15.11.6 Contractor shall make the provisions of this Article applicable to all Subcontracts or purchase orders that exceed or can be reasonably expected to exceed $150,000.

No Waiver:

15.12.1 The rights and remedies set forth in the Contract Documents are not exclusive and are in addition to any other rights and remedies provided by law or equity. The duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder shall be in addition to and not a limitation of any duties, obligations, rights and remedies otherwise imposed or available by New York State law.

15.12.2 No act or omission by Department or Contractor shall constitute a waiver of any right or duty afforded any of them under the Contract Documents, nor shall any such act or omission constitute an approval of or acquiescence in any breach thereunder, except as may be specifically agreed in writing.

Comparable or Equivalent Terms:

15.13.1 Contractor warrants, represents and guarantees that all of the prices, terms, warranties and benefits granted to Department under the Contract are comparable to or better than the equivalent terms, prices, warranties and benefits offered to any other existing customer for similar Work.

15.13.2 In addition to the other remedies available, Department may demand repayment for any excess payment, plus interest thereon, for failure of Contractor to comply with paragraph 15.13.1.

Unlawful Provisions Deemed Stricken:

15.14.1 If the Contract Documents contain any unlawful provisions, such unlawful provisions shall be of no effect. Any provision determined to be unlawful by a court of competent jurisdiction, shall be deemed stricken from the Contract Documents without affecting the validity of the remaining provisions of the Contract Documents.

All Legal Provisions Included:

15.15.1 All provisions of Law required to be included in the Contract Documents shall be and are inserted herein. If through mistake, neglect, oversight or otherwise, any such provision has not been included or included in improper form, upon the application of either party, the Contract Documents shall be amended in writing at no increase in Contract Price nor extension in Contract Time, so as to comply with the Law.

No Estoppel:

15.16 Department or any officer, employee, servant or agent thereof, shall not be estopped, bound or precluded by any determination, return, decision, approval, order, letter, payment or certificate made or given by Engineer or any other officer, employee, servant or agent of Department, at any time, either before or after final completion and acceptance of the Work and payment therefor:

15.16.1 From showing the true and correct amount, classification, quality, and character of the Work completed and materials furnished by Contractor or any other person under the Contract, or from showing at any time that any determination, return, decision, approval, order, letter, payment, or certificate is untrue and incorrect, or improperly made in any particular, or that the Work or the materials or any part thereof, do not in fact conform to the Contract Documents; or,

15.16.2 From demanding the recovery of any overpayments made to Contractor, or such damages as Department may sustain by reason of failure to perform each and every term, provision or condition of the Contract in accordance with its terms.

Prohibited Interests:

15.17 No official of Department who is authorized in such capacity on behalf of Department to negotiate, make, accept or approve or to take part in the negotiating, making or approving any architectural, engineering, inspection, construction or material supply contract or any Subcontractor in connection with the Work or the Project of which the Work is a part, shall be knowingly permitted by Contractor to become directly or indirectly interested personally in this Contract or in any part thereof. No officer, employee, architect, attorney, engineer or project representative of or for Department who is authorized in such capacity and in behalf of Department to exercise any executive, supervisory or other similar function in connection with the Work or the Project of which the Work is a part shall be knowingly permitted by Contractor to become directly interested personally in this Contract or in any part thereof.

No Third Party Beneficiary:

15.18 Contractor acknowledges and agrees that it is not a third party beneficiary to any other agreement between the Department and any third party and/or any work product prepared or work performed for the Department by any third party, including but not limited to the contract between and/or work or work product performed by the Engineer; that nothing in the bid documents or the contract document shall be

construed so as to give the contractor any legal or equitable claim, right or remedy against any other party with whom the Department has contracted, including but not limited to the Engineer; that nothing in any separate agreement between Department and any third party, including but not limited to the Engineer shall be construed to give the contractor any legal or equitable claim, right or remedy against such third party; rather such agreements are acknowledged and agreed to be intended to be for the sole exclusive benefit of the parties thereto. Contractor further acknowledges and agrees that its sole rights and remedies in connection with its bidding and performance of the work to be performed by it under the bid documents and contract documents are limited to such rights and remedies as are provided under the bid documents and contract documents. Further, contractor acknowledges and agrees that no claim against any third party, including but not limited to the Engineer, which is in separate contractual privity with the Department, shall arise out of such contractor=s or the Engineer**=s** performance of services for the Department pursuant to such separate contract.

Nothing herein shall release or waive any direct claim which the Department may have against any such separate contractor, including the Engineer, pursuant to the terms of the Department**=s** contract with such third party.

Should any direct claim be brought by contractor against any third party in separate direct contractual relationship with the Department, contractor agrees to reimburse to the Department and to such separate contractor, including Engineer, their reasonable and necessary costs, including legal fees, incurred in the defense of such claim or claims.

SECTION IX

Supplementary Conditions

Section II – Terms and Definitions shall be supplemented as follows:

Owner or Department – The New York State Department of Environmental Conservation is the Project Owner, unless specifically used in reference to the owners of the properties on and adjacent to the Site.

City – The City of Newburgh is defined as the Site Owner and Site Operator unless otherwise specified.

Section V – Contractor's Responsibilities shall be supplemented as follows:

5.3.1 – Revise Work hours to be 6 days per week, excluding Sunday. Work hours shall not commence prior to 6 AM each day for a maximum of 16 hours per day. Rock removal shall not commence prior to 7 AM each day nor extend later than 7 PM each day.

SECTION X

Standard Specifications

SECTION X
STANDARD SPECIFICATIONS

Division 1

00001	PROGRESS SCHEDULE **(NOT USED)**
00002	CONCRETE **(NOT USED)**
00003	MINIMUM REQUIREMENTS FOR HEALTH AND SAFETY **(NOT USED)**
00004	SURVEYS **(NOT USED)**
00005	PROJECT COORDINATION
00006	FIELD OFFICES **(NOT USED)**
00007	PROJECT SIGN
00008	PROJECT RECORD DOCUMENTS **(NOT USED)**
00009	TRAFFIC CONTROL **(NOT USED)**
00010	TEMPORARY FACILITIES AND CONTROLS **(NOT USED)**
00011	SITE SECURITY **(NOT USED)**
00012	MONITORING WELLS **(NOT USED)**
00013	SAMPLING **(NOT USED)**
00014	MINIMUM REQUIREMENTS FOR WORK PLAN **(NOT USED)**
00015	OFF-SITE TRANSPORTATION AND DISPOSAL **(NOT USED)**
00016	QUALITY CONTROL **(NOT USED)**
00017	DEMOLITION AND REMOVAL **(NOT USED)**
00018	LIST OF ABBREVIATIONS **(NOT USED)**
00019	CLEARING AND GRUBBING **(NOT USED)**
00020	FENCING **(NOT USED)**
00021	SUBMITTALS **(NOT USED)**
00022	DEWATERING **(NOT USED)**
00023	ACCESS ROAD **(NOT USED)**
00024	SHOP DRAWING PROCEDURES **(NOT USED)**
00025	SCHEDULE OF VALUES AND BID BREAKDOWN **(NOT USED)**
00026	TRUCK SCALE **(NOT USED)**
00030	GREEN REMEDIATION PRACTICES **(NOT USED)**

Division 2

00200	EXCAVATION **(NOT USED)**
00201	BACKFILL **(NOT USED)**
00202	TOPSOIL **(NOT USED)**
00203	SEED AND MULCH **(NOT USED)**
00204	EXCAVATION SUPPORT SYSTEMS **(NOT USED)**
00205	ROCK REMOVAL **(NOT USED)**
00206	TRENCHING **(NOT USED)**
00207	PLANTING **(NOT USED)**

Division 3

00301	EARTHWORK **(NOT USED)**
00302	COMPOSITE DRAINAGE NET **(NOT USED)**
00303	FILTER FABRIC **(NOT USED)**
00304	EROSION CONTROL BLANKET **(NOT USED)**
00305	GAS VENTS **(NOT USED)**
00306	RIP RAP AND GABIONS **(NOT USED)**
00307	LINER **(NOT USED)**

Division 4

00400	DRUMS **(NOT USED)**

Division 5

00500	CONCRETE SLAB INSTALLATION **(NOT USED)**

Division 13

13560	THERMAL DESORPTION **(NOT USED)**

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PROJECT COORDINATION

1. GENERAL

1.1 Description

This section includes: requirements for subcontractor approvals.

1.2 Submittals

Submit the following in accordance with Section VIII, Article 5.23-5.29, "shop Drawings and Samples."

1. Subcontractor List: submit for review and approval. This list shall be updated and submitted each time a new subcontractor is proposed for employment on the project (see section VIII, article 5.8.1).

2. Uniform Contracting Questionnaire: submit in accordance with instructions in Section V, Article 2(e). Submit properly executed New York State Uniform Contracting Questionnaire for subcontracts valued at greater than $10,000. The **DEPARTMENT** requires a minimum of two (2) weeks to review.

2. PRODUCTS

2.1 Subcontractor List

The **CONTRACTOR** shall submit a complete list of proposed subcontractors (including disposal facilities) identifying name, address, telephone number, contact, type of work to be subcontracted, dollar amount and M/WBE status. No subcontractors can begin work without the written approval of the **DEPARTMENT**.

3. EXECUTION (NOT USED)

*** END OF SECTION ***

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SPEC 00007

PROJECT IDENTIFICATION AND SIGNS

1. GENERAL

Scope: General Contractor shall provide and maintenance the project identification sign required for the Project.

The sign shall be 4' high by 8' wide, and constructed of 3/4- to 1-inch medium density overlay plywood, with a resin coating on both sides. The edges shall be framed with a snap trim edge cap consisting of an aluminum channel with a polyvinyl coating. An aluminum sign of equal size may also be used. The sign's background will be painted with white exterior oil base sign enamel. The fourth line will have green letters. The first, second and third lines will have blue letters. The NYSDEC logo will be painted as noted. All adhesives are solvent resistant.

1.1 References

Lumber Standard: American Softwood Lumber Standard; U.S. Department of Commerce Product Standard PS20.

Softwood Plywood Standard: Construction and Industrial; U.S. Department of Commercial Product Standard PS1.

1.2 Quality Assurance

Painter's Qualifications: All paint shall be applied by a professional sign painter.

2. PRODUCTS

2.1 Materials

Posts: Standard Grade Douglas Fir, White Pine or Southern Pine; S$S; preservative treated; 4 inch x 4 inch x 12 feet long.

Plywood: Overlaid Plywood; MDO B-B EXT-APA; 3/4 to 1 inch.

Framing: Snap trim edge cao of polyvinyl coated aluminum channel.

Paint:

Background Enamel: Exterior, alkyd, glass enamel with primer as recommended by finish coat manufacturer.

Lettering and Striping Enamel: Exterior, long oil, alkyd; high gloss enamel manufactured for lettering signs.

Colors: As per attached illustration.

2.2 Fabrication

Painting:

Paint both sides and all edges of signs with two coats of primer and one coat of background enamel.

Paint lettering and striping with two coats of lettering enamel.

Do not apply succeeding coat until previous coat has completely dried.

Apply even coats of uniform thickness without brush marks, runs or lap marks.

Lettering and striping shall be uniform with sharp, neat profiles.

3. EXECUTION

3.1 Installation

Install signs within two weeks of Notice to Proceed.

Install signs where directed by Engineer.

Set posts plumb, 4 feet into the ground. Compact backfill around posts.

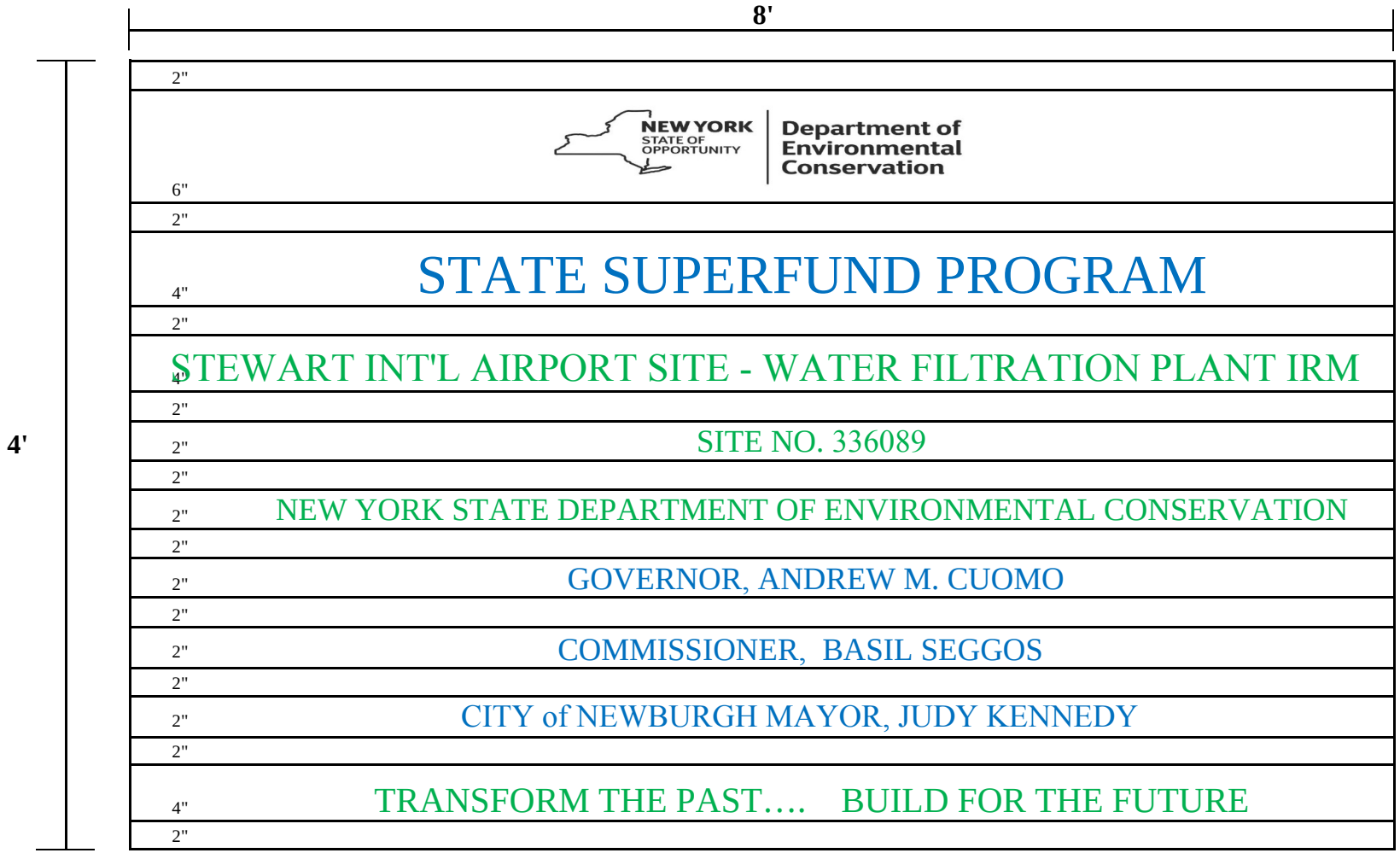
Fasten sign, in a level position, securely to posts. The center of the sign should be located approximately 6 to 7 feet from ground level.

3.2 Maintenance and Removal

Maintain the signs plumb and level for the duration of the work.

When directed, at the completion of the project, remove the signs.

*** END OF SECTION ***



SPEC 00007 - FIGURE 1

PROJECT SIGN

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SECTION XI

Supplementary Specifications

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SECTION 01 12 13

SUMMARY OF WORK

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Table of Articles for this Section is:

Article	Title
1.1	Section Includes
1.2	Location and Description of Work
1.3	Construction Contracts, This Project
1.4	Construction Contracts, Other Projects
1.5	Work by CITY
1.6	Sequence and Progress of Work
1.7	CONTRACTOR's Use of Site
1.8	Easements and Rights-of-Way
1.9	Notices to Owners and Authorities of Properties Adjacent to the Work
1.10	Salvage of Materials and Equipment
1.11	Partial Utilization by CITY

1.2 LOCATION AND DESCRIPTION OF WORK

A. The Work is located at the Washington Lake Filtration Plan, Newburgh, New York.

B. The Work to be performed under this Contract includes, but is not limited to, constructing the Work described below and all related appurtenances. The Work includes, but is not limited to, the following:
   1. Demolition of existing 1 MG buried concrete storage tank, existing yard piping, temporary piping and electrical conduit and cables provided by others and miscellaneous items.
   2. Site work including yard piping, grading, erosion and sediment control, asphalt paving, retaining walls, curbing and miscellaneous items.
   3. Construction of a GAC treatment building.
   4. Construction of a backwash and stormwater tank.
   5. Installation of GAC contactor equipment and carbon media furnished by the DEPARTMENT.
   6. Construction of process piping and associated process equipment.
   7. Construction of process water systems.
   8. Construction of HVAC systems.
   9. Construction of electrical systems.

10. Construction of plumbing systems.
11. Site restoration.
12. Facility commissioning.

C. Contracting Method: The Project will be constructed under multiple prime contracts.

D. Hazardous Environmental Conditions:
1. To the best of DEPARTMENT and CITY's knowledge, information, and belief, the prior use of the Site included no known use or hazardous materials.

E. DEPARTMENT-furnished Materials and Equipment:
1. Administrative and procedural requirements pertaining to DEPARTMENT-furnished materials and equipment are in Section 01 64 00, DEPARMENT-Furnished Products.

1.3 CONSTRUCTION CONTRACTS, THIS PROJECT

A. The Contracts under which the Project will be constructed are:
1. General Construction – Contract No. D010308 Consists of all Work shown, indicated, and required to complete the Project, except that specifically assigned to other prime contractors.
   a. This Contract includes the Work specified in Divisions 01 through 14; Division 22; Division 25; Divisions 27 through 32; Division 33 (excluding work under Section 33 70 00 through Section 33 79 99.99); and Divisions 34 through 48.
   b. This Contract excludes Sections 33 70 00 through 33 79 99.99, and those portions of Section 40 05 96, Vibration, Seismic, and Wind Controls, specifically assigned to other prime contractors.
2. HVAC Construction – Contract No. D010309: Consists of all Work required to complete the Project as shown and as specified in:
   a. Division 01, General Requirements, except that Work specifically assigned to the other prime contractors.
   b. Division 23, Heating, Ventilating, and Air Conditioning.
   c. Those portions of Section 40 05 96, Vibration, Seismic, and Wind Controls, not specifically assigned to other prime contractors.
   d. Other Specification Sections referenced in Division 23.
3. Electrical Construction – Contract No. D010310: Consists of all Work required to complete the Project as shown and as specified in:
   a. Division 01, General Requirements, except that Work specifically assigned to the other prime contractors.
   b. Division 26, Electrical.
   c. In Division 33, Utilities: Sections 33 70 00 through Section 33 79 99.99.
   d. Those portions of Section 40 05 96, Vibration, Seismic, and Wind Controls, not specifically assigned to other prime contractors.

e. Other Specification Sections referenced in Division 26, Electrical, or in those portions of Division 33, Utilities, that are responsibility of Electrical CONTRACTOR.

f. Responsibility for rock removal, excavation and backfilling, concrete, and other construction associated with the electrical Work, but specified under other Divisions, is allocated in Section 26 05 05, General Provisions for Electrical Systems.

4. Plumbing Construction – Contract No. D010326: Consists of all Work required to complete the Project as shown and as specified in:

a. Division 01, General Requirements, except that Work specifically assigned to the other prime contractors.

c. Division 22, Plumbing.

d. Those portions of Section 40 05 96, Vibration, Seismic, and Wind Controls, not specifically assigned to other prime contractors.

e. Other Specification Sections referenced in Divisions 22.

f. Responsibility for rock removal, excavation and backfilling, concrete, and other construction associated with the plumbing Work, but specified under other Divisions, is allocated in Section 22 18 00, Natural Gas Piping Systems.

1.4 CONSTRUCTION CONTRACTS, OTHER PROJECTS

A. Other construction contracts have been or will be awarded by DEPARTMENT that are in close proximity to or border on the Work of this Contract. Work under these other contracts is briefly described as follows:

1. Contact Tank at the Washington Lake Filtration Plant, Contract No D010238:

a. Principal Work Location: east of the GAC treatment building, and adjacent areas.

b. Scope: Project involves: construction of an AWWA D110, Type III pre-stressed concrete contact tank, yard piping and appurtenances.

c. Contract times expected to start running on September 19, 2016.

d. Approximate Substantial Completion: February 3, 2017.

e. Approximate Final Completion: April 14, 2017.

1.5 WORK BY CITY

A. CITY will perform the following in connection with the Work:

1. Operate all existing valves, gates, pumps, equipment, and appurtenances that will affect CITY's operation, unless otherwise specified or indicated.

1.6 SEQUENCE AND PROGRESS OF WORK

A. Requirements for sequencing and coordinating with CITY's operations, including maintenance of facility operations during construction, and requirements for tie-ins and shutdowns, are in Section 01 14 16, Coordination with CITY's Operations.

1.7 CONTRACTOR'S USE OF SITE

A. CONTRACTORS' use of the Site shall be confined to the areas shown.

B. Move stored materials and equipment that interfere with operations of CITY, other contractors, and others performing work for DEPARTMENT or CITY.

C. Limits on CONTRACTOR's use of the Site are:
   1. As indicated in Section 01 14 19, Use of Site.
   2. Do not use the Site for operations other than those required for the Project.

1.8 EASEMENTS AND RIGHTS-OF-WAY

A. General:
   1. Easements and rights-of-way required for the permanent improvements included in the Work will be provided by DEPARTMENT in accordance with the General Conditions and Supplementary Conditions.
   2. Confine construction operations within CITY's property, public rights-of-way, easements obtained by DEPARTMENT, and limits shown, and property for which CONTRACTOR has made arrangements directly with property owner(s).
   3. Use care in placing construction tools, equipment, excavated materials, and materials and equipment to be incorporated into the Work to avoid damaging property and interfering with traffic.
   4. Do not enter private property outside the construction limits without permission from the owner of the property.

B. On Private Property:
   1. General limits of DEPARTMENT-furnished easements are shown on the Drawings.

C. Within Highway Rights-of-Way:
   1. Permits required for the permanent facilities will be obtained by DEPARTMENT.
   2. Work performed and CONTRACTORS' operations within limits of highway rights-of-way shall comply with requirements of highway owner and applicable work permits, or authority having jurisdiction over right-of-way.
   3. Comply with Section 01 14 33, Work in Highway Rights-of-Way, and Section 01 41 24, Permit Requirements.

1.10 NOTICES TO OWNERS AND AUTHORITIES OF PROPERTIES ADJACENT TO THE WORK

A. Notify owners of adjacent property and utility owners when prosecution of the Work may affect their property, facilities, or use of property.

B. When it is necessary to temporarily obstruct access to property, or when utility service connection will be interrupted, provide notices sufficiently in advance to enable affected persons to provide for their needs. Such notifications shall comply with Laws and Regulations and, whether delivered orally or in writing, shall include appropriate information concerning the interruption and instructions on how to limit inconvenience caused thereby.

C. Notify utility owners and other concerned entities not less than 72 hours prior to cutting or closing streets or other traffic areas or excavating near Underground Facilities or exposed utilities.

1.11 SALVAGE OF MATERIALS AND EQUIPMENT

A. Existing materials and equipment removed and not shown or specified to be reused in the Work will become property of the prime CONTRACTOR responsible for such removal, except the following items that shall remain CITY's property:
   1. Existing high lift pumps.

B. Existing materials and equipment removed by CONTRACTOR shall not be reused in the Work, except for the following:
   1. None.

C. Removal, Storage, Handling, Reinstallation:
   1. Carefully remove in manner to prevent damage all materials and equipment shown or indicated to be salvaged and reused or to remain property of CITY.
   2. Store and protect salvaged items shown or indicated to be used in the Work.
   3. Replace in-kind or with new items those items of materials and equipment damaged during removal, storage, or handling through CONTRACTOR's actions, negligence, or improper procedures.

D. CONTRACTOR may furnish and install new items, with ENGINEER's approval, instead of those specified or indicated to be salvaged and reused, in which case such removed items will become CONTRACTOR's property.

1.12 PARTIAL UTILIZATION BY CITY

A. Prior to Substantial Completion of the entire Work under each prime Contract, substantially complete the Work as follows:
   1. GAC treatment building.
   2. GAC feed pumps.
   3. High lift pumps.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 13 13

MILESTONES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section describes Work to be substantially completed to comply with Milestones indicated in the Agreement. This Section is not intended to describe all the Work or its constraints, interrelationships, or sequential requirements required.
   2. CONTRACTOR shall provide all labor, materials, equipment, tools, and incidentals required to perform the Work in accordance with the Contract Times provisions of the Contract Documents.
   3. To achieve each Milestone indicated in this Section, substantially complete those elements of the Work indicated starting with Article 1.2 of this Section, together with related equipment, systems, and appurtenant Work and activities.
   4. Comply with the General Conditions, as may be modified by the Supplementary Conditions, regarding partial utilization and property insurance.

1.2 MILESTONE REQUIREMENTS

A. Milestone A:
   1. Granular Activated Carbon (GAC) Contactor Nos. 1 through 6 will be available for receipt by the CONTRACTOR at the Site on March 13, 2017
   2. DEPARTMENT will be responsible for storage off site of DEPARTMENT furnished equipment for 135 days after March 13, 2017. CONTRACTOR shall complete Work required to receive GAC Contactor Nos. 1 through 6 prior to 135 days after March 13, 2017.

B. Milestone B:
   1. GAC Contactor Nos. 7 through 12 will be available for receipt by the CONTRACTOR at the Site on April 3, 2017
   2. DEPARTMENT will be responsible for storage off site of DEPARTMENT furnished equipment for 114 days after April 3, 2017. CONTRACTOR shall complete Work required to receive GAC Contactor Nos. 7 through 12 prior to 114 days after April 3, 2017.

C. Milestone C:
   1. GAC Contactor Nos. 13 through 18 will be available for receipt by the CONTRACTOR at the Site on April 24, 2017

2. DEPARTMENT will be responsible for storage off site of DEPARTMENT furnished equipment for 93 days after April 24, 2017. CONTRACTOR shall complete Work required to receive GAC Contactor Nos. 7 through 12 prior to 93 days after April 24, 2017.

D. Milestone D:
   1. Granular activated carbon (GAC) media will be available for receipt by the CONTRACTOR at the Site on May 1, 2017
   2. DEPARTMENT will be responsible for storage off site of DEPARTMENT furnished equipment for 120 days after May 1, 2017. CONTRACTOR shall complete Work required to receive GAC media prior to 120 days after May 1, 2017.

E. Milestone E:
   1. GAC Contactor Systems 1A, 1B, 2A, 2B, 3A, 3B, 4A, 4B, 5A, 5B, 6A and 6B, as shown on the Drawings, approved for use by New York State Department of Health on or before September 15, 2017.
   2. CONTRACTOR shall complete all Work required to provide a fully functioning and operational GAC treatment system comprised of the GAC Contactor Systems listed in this Paragraph inclusive of three high lift pumps located in the GAC Treatment Building, three GAC feed pumps located in the Head House, all yard piping and tie-ins to existing piping systems for GAC feed, GAC backwash feed, GAC backwash drains and water mains for high and low service, chemical feed systems, electric systems and instrumentation and control systems.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 14 16

COORDINATION WITH CITY'S OPERATIONS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes requirements for coordinating with CITY's operations during the Project, and includes requirements for tie-ins and shutdowns necessary to complete the Work without impact on CITY's operations except as allowed in this Section.
   2. CONTRACTOR shall provide all labor, materials, equipment, tools, and incidentals shown, specified, and required to coordinate with CITY's operations during the Work in accordance with this Section.

B. Coordination:
   1. Review construction procedures under other Specifications sections and coordinate Work that will be performed with or before the Work specified in this Section.

C. Related Sections:
   1. Section 01 11 13, Summary of Work.
   2. Section 01 73 29, Cutting and Patching.
   3. Section 01 73 24, Connections to Existing Facilities.

D. Except for shutdowns specified in this Section, perform the Work such that CITY's facilities remain in continuous satisfactory operation during the Project. Schedule and conduct the Work such that the Work does not: impede CITY's production or processes, create potential hazards to operating equipment and personnel, reduce the quality of the facility's products or effluent, cause odors or other nuisances, or affect the public health, safety, and convenience.

E. Work not specifically covered in this Section or in referenced Sections may, in general, be completed, within the Contract Times, at any time during regular working hours in accordance with the Contract Documents, subject to the requirements in this Section.

F. As a substitute to the procedures specified in this Section, CONTRACTOR may propose providing additional temporary facilities that can eliminate or mitigate a constraint without additional cost to DEPARTMENT, provided such additional temporary facilities: do not present hazards to the public, personnel, structures, and equipment; that such additional temporary facilities do not adversely affect CITY's ability to comply with Laws and Regulations, permits, and operating requirements; that such temporary facilities do not generate or foster the

generation of odors and other nuisances; and that requirements of the Contract Documents are fulfilled.

G. Coordinate shutdowns with ENGINEER and CITY. When possible, combine multiple tie-ins into a single shutdown to reduce impacts on CITY's operations and processes.

H. Operation of Existing Systems and Equipment during the Work:
   1. Do not shut off or disconnect existing operating systems or equipment, unless accepted by ENGINEER in writing.
   2. Operation of existing systems and equipment will be by CITY unless otherwise specified or indicated.
   3. Where necessary for the Work, CONTRACTOR shall seal or bulkhead CITY-operated gates and valves to prevent leakage that may affect the Work, CITY's operations, or both.
   4. Provide temporary watertight plugs, bulkheads, and line stops as required. After completing the Work, remove seals, plugs, bulkhead, and line stops to satisfaction of ENGINEER.

I. Bypassing:
   1. Diversion of flows around treatment processes is not allowed.

1.2 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Substitute Sequence Submittal: When deviation from specified sequence or procedures is proposed, furnish submittal explaining in detail the proposed sequence or procedures and associated effects, including evidence that OWNER's operations will not be adversely affected, to an extent greater than originally contemplated in the Contract Documents, by proposed substitution. List benefits of proposed substitution, including benefits to Progress Schedule. Submit in accordance with Section 01 25 00, Substitution Procedures, and other requirements of the Contract Documents regarding substitution requests.

B. Informational Submittals: Submit the following:
   1. Shutdown Planning Submittal:
      a. For each shutdown, submit an inventory of labor, materials, and equipment required to perform the shutdown and tie-in tasks, an estimate of time required to accomplish the complete shutdown including time for CITY to take down and start up existing equipment, systems, or conduits, and written description of steps required to complete the Work associated with the shutdown.
      b. Furnish submittal to ENGINEER not less than 15 days prior to proposed shutdown start date. Do not start shutdown until obtaining ENGINEER's acceptance of shutdown planning submittal.

2. Shutdown Notification: After ENGINEER's acceptance of shutdown planning submittal and prior to starting the shutdown, submit written notification to CITY and ENGINEER of date and time each shutdown is to start. Submit notification not less than 72 hours in advance of each shutdown.

1.3 GENERAL CONSTRAINTS

A. Indicated in the Contract Documents are the sequence and shutdown durations, where applicable, for CITY'S equipment, systems, and conduits (including piping and ducting) that are to be taken out of service temporarily for the Work. New materials, equipment, and systems may be used by DEPARTMENT or CITY after the specified field quality controls and testing are successfully completed and the materials or equipment are Substantially Complete in accordance with the Contract Documents.

B. The following constraints apply to coordination with CITY's operations:
   1. Operational Access: CITY'S personnel shall have access to equipment and areas of the facility that remain in operation.
   2. Temporary Partitions and Enclosures: Provide temporary partitions and enclosures necessary to maintain dust-free, heated, and ventilated spaces in areas of the facility that are adjacent to the Work and that must be kept operational. Comply with Section 01 51 05, Temporary Utilities.
   3. Schedule and perform equipment and system start-ups for Monday through Thursday. Equipment and systems shall not be placed into operation on Friday, Saturday, and Sunday without prior approval of OWNER, unless specifically indicated otherwise in the Contract Documents.
   4. Dead End Valves or Conduits: Provide blind flanges, watertight bulkheads, or valve at temporary and permanent terminuses of conduits, including piping and ducting. Blind flanges and bulkheads shall be suitable for the service and braced and blocked, as required, or otherwise restrained as directed by ENGINEER. Temporary valves shall be suitable for their associated service. Where valve is provided at permanent terminus of conduit, including piping or ducting, also provide on downstream side of valve a blind flange with drain/flushing connection.
   5. CITY will assist CONTRACTOR in dewatering process tanks, basins, conduits, and other work areas to be dewatered for shutdowns. Maintain clean and dry work area by pumping and properly disposing of fluid and other material that accumulates in work areas.
   6. Draining and Cleaning of Conduits, Tanks, and Basins:
      a. Unless otherwise shown or indicated, CONTRACTOR shall dewater process tanks, basins, conduits (including piping) at beginning of each shutdown. Flush, wash down, and clean tanks, basins, conduits (including piping), and other work areas.
      b. CONTRACTOR shall remove liquids and solids and dispose of them at appropriate location at the Site as directed by ENGINEER. Unless otherwise specified or indicated, contents of tanks, basins, and

conduits (including piping) undergoing modifications shall be transferred to existing process tanks or conduits at the Site with capacity sufficient to accept such discharges, using hoses, temporary piping, temporary pumps, or other means provided by CONTRACTOR. Discharge of fluids across floors is not allowed.

c. If drainage point is not available on the conduit (including piping) to be drained, provide a wet tap using tapping saddle and valve or other method approved by ENGINEER. Uncontrolled spillage of contents of conduits (including piping) is not allowed.

d. Spillage shall be brought to ENGINEER's attention immediately, both verbally and in writing, and reported in accordance with Laws and Regulations. CONTRACTOR shall wash down spillage to floor drains or sumps or other appropriate location and flush the system to prevent clogging and odors. If spillage is not suitable for discharge to the drainage system, such as chemical spills, as determined by ENGINEER, CONTRACTOR shall remove spillage by other method, such as vactor truck, sorbents, or other method acceptable to ENGINEER.

1.4 SEQUENCE OF WORK

A. Perform the Work in the indicated sequence. Certain phases or stages of the Work may require working 24-hour days or work during hours outside of regular working hours. Work may be accelerated from a later stage to an earlier stage if CITY's operations are not adversely affected by proposed sequence change, with ENGINEER's acceptance. Stages specified in this Article 1.4 are sequence-dependent.

B. Stage I: Washington Lake Filtration Plant operating conditions: low service water supplied by existing High Lift Pump No. 3 through existing temporary LSW main to existing Contract Tank and high service water supplied by existing High Service Pump No. 1.

C. Stage II: Washington Lake Filtration Plant operating conditions: New electric service providing power to Washington Lake Filtration Plant.

D. Stage III: Washington Lake Filtration Plant operating conditions: New 20-inch HSW water connection to existing 20-inch HSW is available for operation to feed water to BF to DEPARTMENT furnished GAC Contactor Systems for flushing and testing. 8-inch BD is available for operation for DEPATMENT furnished GAC Contactor Systems for flushing and testing.

E. Stage IV: Washington Lake Filtration Plant operating conditions: GAC Feed Pump No. 1 installed and available for operation, all water supplied by existing High Lift Pumps No. 2 and 3 through existing temporary LSW main to existing Contract Tank and high service water supplied by new High Service Pumps, Backwash Tank supplied by HSW, DEPARMENT furnished GAC Contactor

Systems and GAC media installed, flushed, tested and approved for use by the NYS DOH per the requirements of Milestone E.

F. Stage V: Washington Lake Filtration Plant operating conditions: GAC Feed Pump supplying filtered water (limited to 5.5 mgd) to GAC Contactor System for treatment and to Contact Tank, chemical feed system delivering chemicals for addition in GAC Treatment Building.

G. Stage VI: Washington Lake Filtration Plant operating conditions: All GAC Feed Pump operations and supplying filtered water to GAC Contactor System for treatment and to Contact Tank. Washington Lake Filtration Plant fully operational for DEPARMENT furnished GAC Contactor Systems and GAC media installed, flushed, tested and approved for use by the NYS DOH per the requirements of Milestone E.

H. Stage VII: Washington Lake Filtration Plant operating conditions: Fully operational with raw water from Washington Lake.

I. Stage VIII: All DEPARMENT furnished GAC Contactor Systems and GAC media installed, flushed, tested and approved for use by the NYS DOH.

1.5 TIE-INS

A. Table 01 14 16-A in this Section lists connections by CONTRACTOR to existing facilities. Table 01 14 16-A may not include all tie-ins required for the Work; CONTRACTOR shall perform tie-ins required to complete the Work as shown or indicated regardless of whether tie-in is indicated in Table 01 14 16-A. For tie-ins not indicated in Table 01 14 16-A, obtain requirements for tie-ins from ENGINEER by requesting an interpretation or clarification.

1.6 SHUTDOWNS

A. General:
   1. Terminology: A “shutdown” is when a portion of the normal operation of CITY’s facility, whether equipment, systems, conduit (including piping and ducting), has to be temporarily suspended or taken out of service to perform the Work.
   2. Work that may interrupt normal operations shall be accomplished at times convenient to CITY unless otherwise indicated in the Contract Documents.
   3. Furnish at the Site, in close proximity to the shutdown and tie-in work areas, tools, materials, equipment, spare parts, both temporary and permanent, necessary to successfully perform the shutdown. Complete to the extent possible, prefabrication of piping and other assemblies prior to commencing the associated shutdown. Demonstrate to ENGINEER’s satisfaction that CONTRACTOR has complied with such requirements before commencing the shutdown.

4. If CONTRACTOR's operations cause an unscheduled interruption of CITY's operations, immediately re-establish satisfactory operation for CITY.
5. Unscheduled shutdowns or interruptions of continued safe and satisfactory operation of CITY's facilities that result in fines or penalties by authorities having jurisdiction shall be paid solely by CONTRACTOR if, in ENGINEER's opinion, CONTRACTOR did not comply with requirements of the Contract Documents, or was negligent in the Work, or did not exercise proper precautions in performing the Work and complying with applicable permits, Laws, and Regulations.
6. Shutdowns shall be in accordance with Table 01 14 16-B of this Section. Work requiring service interruptions for tie-ins shall be performed during scheduled shutdowns.
7. Temporary, short-term shutdowns of smaller conduits (including piping and ducting), equipment, and systems may not be included in Table 01 14 16-B. Coordinate requirements for such shutdowns with ENGINEER and CITY. Where necessary, obtain ENGINEER's interpretation or clarification before proceeding.

B. Shutdowns of Electrical Systems:
1. Comply with Laws and Regulations, including the National Electric Code.
2. CONTRACTOR shall lock out and tag circuit breakers and switches operated by OWNER and shall verify that affected cables and wires are de-energized to ground potential before shutdown Work is started.
3. Upon completion of shutdown Work, remove the locks and tags and notify ENGINEER that facilities are available for use.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 GENERAL

A. In addition to requirements of this Section, comply with Section 01 73 29, Cutting and Patching, and Section 01 73 24, Connections to Existing Facilities, and other Contract Documents applicable to Work associated with shutdowns, tie-ins, temporary pumping (where applicable), and similar work.

3.2 DETAILED SHUTDOWN REQUIREMENTS

A. Shutdown A:
1. General:
a. Affected Equipment Operating Prior to Shutdown: Washington Lake Filtration Plant Backup Generator and Backwash Pump Station.

b. Equipment Operating During Shutdown: In accordance with Table 01 14 16-B of this Section.
c. Equipment Out of Service During Shutdown: In accordance with Table 01 14 16-B of this Section.
d. Impact on Other Equipment and Processes: Emergency generator and filter backwashing.
e. Procedure: CONTRACTOR shall coordinate the relocation of the existing utility pole with CHG&E. Notify the ENGINEER and CITY seven days prior to the shutdown of the existing electrical service to the Washington Lake Filtration Plant. CITY will coordinate the backwashing of sand filters, filling distribution system storage and preparing backup generator for 24 hour continual usage. CONTRACTOR shall have materials on hand to complete the Work once authorized by ENGINEER and have previously provided conduits and cables from the relocated utility pole to a close proximity to the existing transformer.
f. Dates: Not Applicable.
g. Time: Shutdown shall be performed during a continuous 24 hour period convenient to the CITY.

2. Following Shutdown:
   a. Verify functionality of new electrical service.

B. Shutdown B:
1. General:
   a. Affected Equipment Operating Prior to Shutdown: Washington Lake Filtration Plant
   b. Equipment Operating During Shutdown: In accordance with Table 01 14 16-B of this Section.
   c. Equipment Out of Service During Shutdown: In accordance with Table 01 14 16-B of this Section.
   d. Impact on Other Equipment and Processes: Chemical feed systems.
   e. Procedure: Notify the ENGINEER and CITY seven days prior to the shutdown of the Washington Lake Filtration Plant. CITY will coordinate filling distribution system storage. CONTRACTOR shall have materials on hand to complete the Work once authorized by ENGINEER. CITY will operate isolation valves on chemical feed piping and CONTRACTOR shall drain and containerize chemical piping contents for offsite disposal. CONTRACTOR shall provide in new tees, valves and temporary plugs on chemical feed piping to be routed to the GAC Treatment Building. CONTRACTOR shall provide an 8-inch wet tap and valve on the 8-inch PW piping located in the Head House. CONTRACTOR shall pressure test isolated chemical feed piping segments and PW piping. CONTRACTOR shall disinfect PW piping. CITY will operate valves and return Washington Lake Filtration Plant, chemical feed systems and plant water system to operation.
   f. Dates: Not Applicable.

g. Time: Shutdown shall be performed during a 4 hour period during normal working hours convenient to the CITY.

2. Following Shutdown:
   a. Verify functionality of equipment and systems.
   b. Verify operation of new equipment and systems, and verify that joints in conduits (including piping and ducting) are watertight or gastight as applicable.
   c. Repair joints that are not watertight or gastight, as applicable.

C. Shutdown C:
1. General:
   a. Affected Equipment Operating Prior to Shutdown: Washington Lake Filtration Plant.
   b. Equipment Operating During Shutdown: In accordance with Table 01 14 16-B of this Section.
   c. Equipment Out of Service During Shutdown: In accordance with Table 01 14 16-B of this Section.
   d. Impact on Other Equipment and Processes: Contact Tank and new High Service Pumps.
   e. Procedure: Notify the ENGINEER and CITY seven days prior to the shutdown of the Washington Lake Filtration Plant. CITY will coordinate baskwashing filters and filling the water system storage tanks. CONTRACTOR shall have materials on hand to complete the Work once authorized by ENGINEER. CITY will operate valves to isolate Clearwell No. 3 and existing High Lift Pumps and denergize High Lift Pump No. 1. CONTRACTOR shall remove any remaining filtered water from Clearwell No. 3. CONTRACTOR shall core concrete wall of Clearwell No. 3 and provide new suction piping and isolation valve. CONTRACTOR shall replace existing tee in the HSW pump header and provide isolation valves. CONTRACTOR shall pressure test, disinfect and sample suction and discharge piping sections of pipe. CONTRACTOR shall disinfect Clearwell No. 3. CITY will operate valves and return Washington Lake Filtration Plant to operation. If not completed at the time of testing, CONTRACTOR shall provide GAC Feed Pump No. 1. CONTRACTOR shall pressure test, disinfect and sample suction and discharge piping sections of pipe not tested previously, if any. CONTRACTOR shall provide ENGINEER with testing results as soon as available.
   f. Dates: Not Applicable.
   g. Time: Shutdown shall be performed between 10:00 pm and 10:00 am.
2. Following Shutdown:
   a. Verify functionality of equipment and systems.
   b. Verify operation of new equipment and systems, and verify that joints in conduits (including piping and ducting) are watertight or gastight as applicable.
   c. Repair joints that are not watertight or gastight, as applicable.

d. CITY will operate valves on the existing HSW header and all flow will be pumped to the Contact Tank. New High Service Pumps will remain in operation.

D. Shutdown D:

1. General:

a. Affected Equipment Operating Prior to Shutdown: Washington Lake Filtration Plant.

b. Equipment Operating During Shutdown: In accordance with Table 01 14 16-B of this Section.

c. Equipment Out of Service During Shutdown: In accordance with Table 01 14 16-B of this Section.

d. Impact on Other Equipment and Processes: Contact Tank and new High Service Pumps.

e. Procedure: Notify the ENGINEER and CITY seven days prior to the shutdown of the Washington Lake Filtration Plant. CITY will coordinate baskwashing filters and filling the water system storage tanks. CONTRACTOR shall have materials on hand to complete the Work once authorized by ENGINEER. CONTRACTOR shall provide a 20-inch line stop on the existing 20-inch HSW. CITY will operate 20-inch BFV or 20-inch GV on the HSW in the Head House to isolate HSW. CONTRACTOR shall remove portions of the existing 20-inch HSW to facilitate connection with 20-inch FW to GAC Treatment Building and provide piping and fittings for the connection. CONTRACTOR shall provide plug and thrust restraint on the 20-inch HSW distribution near the line stop. CONTRACTOR shall pressure test and disinfect FW piping. CONTRACTOR shall provide ENGINEER with testing results as soon as available.

f. Dates: Not Applicable.

g. Time: Shutdown shall be performed between 10:00 pm and 10:00 am.

2. Following Shutdown:

a. Verify functionality of equipment and systems.

b. Verify operation of new equipment and systems, and verify that joints in conduits (including piping and ducting) are watertight or gastight as applicable.

c. Repair joints that are not watertight or gastight, as applicable.

d. Once approved by NYS DOH and as directed by the ENGINEER and approved by CITY, GAC Feed Pump No. 1 will be activated by CITY and FW will be provided to the GAC Contactor Systems for treatment.

E. Shutdown E:

1. General:

a. Affected Equipment Operating Prior to Shutdown: Washington Lake Filtration Plant and GAC Contactor Systems.

b. Equipment Operating During Shutdown: In accordance with Table 01 14 16-B of this Section.

c. Equipment Out of Service During Shutdown: In accordance with Table 01 14 16-B of this Section.
d. Impact on Other Equipment and Processes: Contact Tank and new High Service Pumps.
e. Procedure: Notify the ENGINEER and CITY seven days prior to the shutdown of the Washington Lake Filtration Plant. CITY will coordinate baskwashing filters and filling the water system storage tanks. CONTRACTOR shall have materials on hand to complete the Work once authorized by ENGINEER. CITY will operate valves to isolate Clearwell No. 3 and existing High Lift Pumps and denergize High Lift Pump Nos. 2 and 3. CONTRACTOR shall remove any remaining filtered water from Clearwell No. 3. CONTRACTOR shall core concrete wall of Clearwell No. 3 and provide new suction piping and isolation valves for GAC Feed Pump Nos 2 and 3. CONTRACTOR shall replace existing tees in the HSW pump header and provide isolation valves. CONTRACTOR shall pressure test, disinfect and sample suction and discharge piping sections of pipe. CONTRACTOR shall disinfect Clearwell No. 3. CITY will operate valves and return Washington Lake Filtration Plant to operation. If not completed at the time of testing, CONTRACTOR shall provide GAC Feed Pump Nos. 2 and 3. CONTRACTOR shall pressure test, disinfect and sample suction and discharge piping sections of pipe not tested previously, if any. CONTRACTOR shall provide ENGINEER with testing results as soon as available.
f. Dates: Not Applicable.
g. Time: Shutdown shall be performed between 10:00 pm and 10:00 am.

2. Following Shutdown:
a. Verify functionality of equipment and systems.
b. Verify operation of new equipment and systems, and verify that joints in conduits (including piping and ducting) are watertight or gastight as applicable.
c. Repair joints that are not watertight or gastight, as applicable.

F. Shutdown F:
1. General:
a. Affected Equipment Operating Prior to Shutdown: Washington Lake Filtration Plant and GAC Contactor Systems.
b. Equipment Operating During Shutdown: In accordance with Table 01 14 16-B of this Section.
c. Equipment Out of Service During Shutdown: In accordance with Table 01 14 16-B of this Section.
d. Impact on Other Equipment and Processes: Washington Lake Filtration Plant and GAC Contactor Systems.
e. Procedure: ENGINEER and CITY will notify CONTRACTOR 7 days before raw water supply will be switched from Catskill Aqueduct water to Washington Lake source for treatment at the Washington Lake Filtration Plant. CITY will operate valves.

f. Dates: Not Applicable.
g. Time: Shutdown shall be performed at the convenience of the CITY.

3.3 SCHEDULES

A. The schedules indicated below, attached following this Section's "End of Section" designation, are part of this Specifications Section:
   1. Table 01 14 16-A, Schedule of Tie-ins.
   2. Table 01 14 16-B, Schedule of Shutdowns.

+ + END OF SECTION + +

TABLE 01 14 16-A SCHEDULE OF TIE-INS					
Tie-In No.	**New Line Size and Service**	**Existing (Connecting) Line Size & Service**	**Tie-In Building/Location**	**Construction Stage**	**Remarks**
1	Utility pole at NYS Route 207 and service feeder to main transformer.	Main electric service to Washington Lake Filtration Plant	Main transformer to the Washington Lake Filtration Plant	II	New utility pole to be provided by CHG&E.
2	24-inch and 36-inch LSW from Contact Tank to GAC Treatment Building to supply High Lift Pumps	36-inch LSW from Contact Tank	Yard Piping, shown on Drawings Sheet C-X	III	Verify 36-inch gate valve is closed and remove existing blind flange and Pressure test, disinfect and sample LSW from tie-in to High Service Pumps.
3	24-inch TW from GAC Treatment Building to Contact Tank	24-inch TW from Contact Tank	Yard Piping, shown on Drawings Sheet C-X	III	Verify 24-inch gate valve is closed and remove existing blind flange and Pressure test and disinfect TW from tie-in to High Service Pumps.
4	20-inch HSW from GAC Treatment Building to existing 20-inch HSW	20-inch HSW to Distribution	Yard Piping, shown on Drawings Sheet C-X	III	Provide 20-inch wet tap and valve. Pressure test, disinfect and sample 20-inch HSW from High Service Pumps to connection with existing 20-inch HSW.
5	8-inch BD from GAC Treatment Building	NA	Yard Piping, shown on Drawings Sheet C-X	III	
6	6-inch D and 4-inch FD from GAC Treatment Building	12-inch sewer	Yard Piping, shown on Drawings Sheet C-X	III	
7	1-inch sodium hypochlorite, phosphate and fluoride chemical feed and 8-inch PW	1-inch sodium hypochlorite, phosphate and fluoride chemical feed and 8-inch PW	Chemical Building and Head House	III	Close valves. Provide tees and isolation valves for the chemical system in the Chemical Building. Provide 8-inch wet tape and valve for PW piping in Head House. Test and disinfect piping as required.
8	GAC Feed Pump No. 1, 12-inch suction and 12-inch discharge FW	High Service Pump No. 1, 6-inch suction and 8-inch discharge FW	Head House	IV	Close 20-inch GV or 20-inch BFV. Drain Clearwell No.3, provide new wall penetration, suction FW and discharge FW to isolation valves. Clean Clearwell No. 3, disinfect structure and

					pressure test and disinfect FW and sample. Replace High Service Pump with GAC Feed Pump.
9	20-inch FW to GAC Treatment Building	20-inch HSW to Distribution	Yard Piping, shown on Sheet C-X	V	After NYS DOH approval to place GAC Contactors, close 20-inch BFV or GV on HSW header, provide 20-inch line stop on existing 20-inch HSW, remove 20-inch HSW between line stop and point of connection, blind flange and restrain or thrust block distribution side and connect 20-inch FW to GAC Treatment Building to existing 20-inch HSW on the Head House side.
10	GAC Feed Pump Nos. 2 and 3, 12-inch suction and 12-inch discharge FW	High Service Pump Nos. 2 and 3, 8-inch suction and 8-inch discharge FW	Head House	VI	Drain Clearwell No.3, provide new wall penetrations, suction FW and discharge FW to isolation valves. Clean Clearwell No. 3, disinfect structure and pressure test and disinfect FW and sample. Replace existing High Service Pumps with GAC Feed Pumps.
11	24-inch FBW	24-inch FBW	Yard Piping, shown on Sheet C-X	V	Remove connection to existing 24-inch FBW to LSW

TABLE 01 14 16-B SCHEDULE OF SHUTDOWNS				
Shut-down No.	**Process Equipment and Service Lines Out-of-Service During Shutdown**	**Process Equipment In Operation During Shutdown**	**Tie-In Nos.**	**Maximum Duration**
A	Electric Service to Washington Lake Filtration Plant, Backwash Pump Station	Backup generator to provide power to Washington Lake Filtration Plant, except Backwash Pump Station	1	24 hours
B	Washington Lake Filtration Plant, except Contact Tank and new High Service Pumps	Contact Tank and new High Service Pumps	7	4 hours
D	Washington Lake Filtration Plant, except Contact Tank and new High Service Pumps	Contact Tank and new High Service Pumps	9	12 hours
E	Washington Lake Filtration Plant, except Contact Tank and new High Service Pumps	Contact Tank and new High Service Pumps	10	12 hours
F	Washington Lake Filtration Plant, except Contact Tank and new High Service Pumps	Contact Tank and new High Service Pumps	GAC Treatment System Start up	8 hours
G	Backwash Pump Station	Washington Lake Filtration Plant, except Backwash Pump Station	11	8 hours

SECTION 01 14 19

USE OF SITE

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes requirements for use of the Site during the Project, and includes requirements for use of existing facilities, as applicable.
   2. CONTRACTOR shall provide all labor, materials, equipment, tools, and incidentals shown, specified, and required to comply with restrictions on CONTRACTOR's use of the Site and other areas.
   3. Comply with requirements of the General Conditions, as may be modified by the Supplementary Conditions, regarding the CONTRACTOR's use of the Site and other areas.

1.2 USE OF PREMISES

A. Limit use of premises at the Site to work areas shown or indicated on the Drawings and as specified in this Section. Do not disturb portions of the Site beyond areas of the Work.
   1. Limits:
      a. Confine construction operations to the following areas:
         1) Areas as shown on the drawings.
      b. Confine storage of materials and equipment, and locations of temporary facilities to the following areas:
         1) Areas as shown on the drawings.
      c. Do not enter the following areas:
         1) Areas outside of the work areas indicated in Paragraph 1.2.A.1.a of this Section and outside of work areas indicated on the Drawings, including outside the Project areas indicated on the "key plan" in the Drawings.
   2. Access to Site, Access Roads, and Parking Areas: Refer to Section 01 55 13, Access Roads and Parking Areas.

B. Use of Existing Buildings and Structures: Maintain existing buildings and structures in weather-tight condition throughout construction unless otherwise indicated in the Contract Documents. Protect buildings, structures, and occupants during construction.
   1. Use of existing electricity: Refer to Section 01 51 13, Temporary Electricity.
   2. Use of existing sanitary facilities: Refer to Section 01 52 19.
   3. Use of existing first aid facilities: Refer to Section 01 51 16, First Aid Facilities.

C. Promptly repair damage to premises caused by construction operations. Upon completion of the Work, restore premises to specified condition; if condition is not specified, restore to pre-construction condition.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 25 00

SUBSTITUTION PROCEDURES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope: Section includes:
   1. Administrative and procedural requirements for selecting materials and equipment for the Project.
   2. Procedural requirements for substitutions of materials and equipment.
   3. Procedural requirements for substitute construction methods or procedures, when construction methods or procedures are specified.

B. A proposed substitute will not be accepted for review if:
   1. Approval would require changes in design concept or a substantial revision of the Contract Documents.
   2. Approval would delay completion of the Work or the work of other contractors.
   3. Substitution request is indicated or implied on a Shop Drawing or other submittal, or on a request for interpretation or clarification, and is not accompanied by CONTRACTOR's formal and complete request for substitution.

C. If proposed substitute is not approved, CONTRACTOR shall provide the specified materials, equipment, method, or procedure, as applicable.

D. Approval of a substitute does not relieve CONTRACTOR from requirement for submitting Shop Drawings and other submittals in accordance with the Contract Documents.

E. ENGINEER and DEPARTMENT have the right to rely upon the completeness and accuracy of the information included in CONTRACTOR's request for approval of a substitute, and CONTRACTOR accepts full responsibility for the completeness and accuracy thereof.

F. When approved substitute is defective or fail to perform in accordance with the Contract Documents, responsibility for remedying the defect or failure resides solely with CONTRACTOR and Supplier.

1.2 SUBSTITUTE MATERIALS AND EQUIPMENT

A. Requests for approval of substitute items of materials or equipment will be considered within a period of 10 days after the issuance of the Purchase Order. After the end of specified period, substitution requests will be considered only in case of

unavailability of a specified item of material or equipment or other conditions beyond CONTRACTOR's control.

B. Procedure:
   1. Submit requests for substitution in accordance with requirements for furnishing submittals, as indicated in Section 01 33 00, Submittal Procedures.
   2. Submit separate request for each proposed substitute.
   3. Submit request for substitution using forms attached to this Section. Complete all information requested on each form, and enclose with the forms supplementary information as required. In addition to requirements of the General Conditions and information required on substitution request forms, include with each substitute request the following:
      a. Identification of the materials and equipment (as applicable), including manufacturer's name and address.
      b. Manufacturer's literature with description of the materials and equipment, performance and test data, and reference standards with which materials and equipment comply.
      c. Samples, when appropriate.
      d. Name and address of similar projects on which the materials and equipment were used, date of installation, and names and contact information (including telephone number) for the facility operations and maintenance manager.

1.3 SUBSTITUTE CONSTRUCTION METHODS OR PROCEDURES

A. Where construction methods or procedures are specified, for a period of 10 days after the issuance of the Agreement and Notice to Proceed, ENGINEER will consider CONTRACTOR's written requests for substitute construction methods or procedures shown or specified in the Contract Documents.

B. The provisions of the General Conditions, as may be modified by the Supplementary Conditions, regarding substitute items of materials and equipment are hereby extended to apply to substitute construction methods or procedures.

C. Procedure:
   1. Submit requests for substitution in accordance with requirements for furnishing submittals, as indicated in Section 01 33 00, Submittal Procedures.
   2. Submit separate request for each proposed substitute.
   3. Submit request for substitution using forms attached to this Section. Complete all information requested on each form, and enclose with the forms supplementary information as required. In addition to requirements of the General Conditions and information required on substitution request forms, include with each substitute request the following:
      a. Detailed description of proposed method or procedure.
      b. Itemized comparison of the proposed substitution with the specified method or procedure.

c. Drawings illustrating method or procedure.
d. Other data required by ENGINEER to establish that proposed substitution is equivalent to specified method or procedure.

1.4 CONTRACTOR'S REPRESENTATIONS

A. In submitting request for substitution, CONTRACTOR represents that:
   1. CONTRACTOR has read and fully understands the provisions regarding substitutes as indicated in the General Conditions, as may be modified by the Supplementary Conditions.
   2. Substitution request is complete and includes all information required by the Contract Documents.
   3. CONTRACTOR certifications required by the General Conditions, as may be modified by the Supplementary Conditions, are valid and made with CONTRACTOR's full knowledge, information, and belief.
   4. CONTRACTOR will provide the same or better guarantees or warranties for proposed substitute as for the specified materials, equipment, methods, or procedures, as applicable.
   5. CONTRACTOR waives all Claims for additional costs or extension of time related to proposed substitute that subsequently may become apparent.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 ATTACHMENTS

A. The documents listed below, and attached following this Section's "End of Section" designation, are part of this Specification Section.
   1. Substitution Request Form (two pages).
   2. Product Substitution Checklist (one page).

+ + END OF SECTION + +

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ARCADIS Design & Consultancy for natural and built assets

SUBSTITUTION REQUEST

Project: _____ Substitution Request Number: _____

_____ From: _____

To: _____ Date: _____

_____ Engineer Project. No._____

Re: _____ Contract For: _____

Specification Title: _____ Description: _____

Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitute: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No.: _____

Installer: _____ Address: _____ Phone: _____

History: ☐ New product ☐ 1 to 4 years old ☐ 5 to 10 years old ☐ More than 10 years old

Differences between proposed substitute and specified item: _____

_____

_____

☐ Point-by-point comparative data attached — REQUIRED BY THE CONTRACT DOCUMENTS

Reason for not providing specified item: _____

_____

Similar Installation:

Project: _____ Engineer: _____

Address: _____ DEPARTMENT: _____

_____ Date Installed: _____

Proposed substitution affects other parts of Work: ☐ No ☐ Yes; explain _____

_____

Savings to DEPARTMENT for accepting substitute: ($)
(attach detailed, itemized estimate)

_____ _____

Proposed substitute changes Contract Time: ☐ No ☐ Yes [Add] [Deduct] _____days.
(clarify whether change is to Substantial Completion, Milestone, or time for readiness for final payment)

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

SUBSTITUTION REQUEST
(Continued)

☐ Substitute product, method, or procedure is subject to payment of licensing fee or royalty (check if "yes" and attach information)

☐ Substitute product, method, or procedure is patented or copyrighted (check if "yes" and attach information)

The undersigned certifies:

- Representations in the General Conditions and in Section 01 25 00, Substitution Procedures, regarding substitutions are valid.
- Same or better warranty and guarantee will be furnished for proposed substitution as for specified item.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitute will have no adverse effect on other trades and will not affect or delay Progress Schedule.
- Cost data as stated above is complete. Claims for additional costs or time related to accepted substitution which may subsequently become apparent are waived.
- Proposed substitute does not affect dimensions and functional clearances.
- Payment will be made for Engineer's review and changes, if any, to the design and Contract Documents, and construction costs caused by the substitute.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

_____

Telephone: _____

Attachments: ☐

ENGINEER'S REVIEW AND ACCEPTANCE (OR NON-ACCEPTANCE) WILL BE DOCUMENTED IN A FIELD ORDER OR CHANGE ORDER, AS APPROPRIATE.

_____

Additional Comments: ☐ Contractor ☐ Subcontractor ☐ Supplier ☐ Manufacturer ☐ Engineer ☐ Other:

Adapted from CSI Form No. 13.0B, 2004 edition

PRODUCT SUBSTITUTION CHECKLIST

Date: _____ Re: _____

Engineer Proj No.: _____ Manufacturer's Project No.: _____

Filing No.: _____ Contract For: _____

Item Equivalence:

☐ Is the submitted item equivalent to the specified item? _____

☐ Does it serve the same function? _____

☐ Does it have the same dimensions? _____

☐ Does it have the same appearance? _____

☐ Will it last as long? _____

☐ Does it comply with the same codes, and standards and performance requirements? _____

☐ Has the item been used locally, and where are the projects? _____

_____

☐ Has a problem occurred with the item, and what was the remedy? _____

_____

Effect on the Project:

☐ Will the substitute affect other aspects of the construction? _____

☐ Are any details affected and are changes required? _____

☐ What is the cost of the changes? _____

☐ Who pays for the required changes? _____

☐ Are Contract Times affected? _____

_____

Effect on the Warranty:

☐ How does the proposed warranty differ from the specified warranty? _____

_____

☐ Does the manufacturer have a track record of standing behind the warranty? _____

_____

Adapted from CSI Form No. 20.3, 1998 edition

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SECTION 01 26 00

CONTRACT MODIFICATION PROCEDURES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope.
   1. This Section expands upon provisions of the General Conditions, as may be modified by the Supplementary Conditions, and includes:
      a. Requests for interpretation.
      b. Written clarifications.
      c. Minor changes in the Work and Field Orders.
      d. Work Change Directives.
      e. Proposal Requests.
      f. Change Proposals.
      g. Change Orders.

B. Submit Contract modification documents to ENGINEER, addressed to the contact person and contact information indicated in Section 01 33 00, Submittal Procedures, and in accordance with Section 01 31 26, Electronic Communication Protocols.

C. Retain at CONTRACTOR's office and at the Site complete copy of each Contract modification document and related documents, and ENGINEER's response.

1.2 REQUESTS FOR INTERPRETATION

A. General.
   1. Transmit written requests for interpretation to ENGINEER. CONTRACTOR and DEPARTMENT may prepare and transmit requests for interpretation.
   2. Prepare and transmit request for interpretation to obtain clarifications or interpretations of the Contract Documents. Report conflicts, errors, ambiguities, and discrepancies in the Contract Documents by requesting an interpretation.
   3. Do not transmit request for interpretation when other form of communication is appropriate, such as CONTRACTOR's submittals, requests for approvals of substitutes, notices, ordinary correspondence, or other form of communication. Improperly prepared or inappropriate requests for interpretation will be returned without response or action by ENGINEER.
   4. Do not submit request for interpretation or clarification when:
      a. answer may be obtained by observations at the Site; or
      b. required information is clearly indicated in the Contract Documents; or

c. required information is included in industry standards referenced in the Contract Documents or Supplier's instructions that are consistent with the Contract Documents; or
d. are reasonably inferable from any of foregoing.

5. CONTRACTOR shall have sole financial responsibility for requests for interpretations or clarifications that are submitted late, out of sequence, or that are unnecessary.

B. Procedure.

1. Transmit requests for interpretation in accordance with Section 01 31 26, Electronic Communication Protocols, and requirements of this Section. Include with each request for interpretation a separate letter of transmittal.
2. ENGINEER will provide timely review of requests for interpretation. Allow sufficient time for review and response.
3. ENGINEER will maintain log of requests for interpretation. Upon request, copy of log will be transmitted to requestor.
4. ENGINEER's response to requests for interpretation will be transmitted in accordance with Section 01 31 26, Electronic Communication Protocols, and requirements of this Section. Each response to a request for interpretation will include a separate letter of transmittal.
5. ENGINEER's written response to each request for interpretation will be distributed to:
   a. CONTRACTOR.
   b. DEPARTMENT.
   c. Resident Project Representative (RPR).
   d. ENGINEER.
6. If ENGINEER requests additional information to make an interpretation, entity requesting the interpretation shall transmit the information requested within ten days, unless ENGINEER allows additional time, via correspondence referring to request for interpretation number.
7. Interpretations that One or Both Parties Believes Entails a Change to the Contract:
   a. If CONTRACTOR or DEPARTMENT believes that a change in the Contract Price or Contract Times or other change to the Contract is required as a result of ENGINEER's interpretation, so advise ENGINEER in writing before proceeding with the Work associated with the request for interpretation.
   b. If, after this initial communication, either DEPARTMENT or CONTRACTOR believes that change in Contract Price, Contract Times, both, or other relief with respect to the terms of the Contract is necessary, recourse shall be in accordance with the Contract Documents.

C. Preparation of Requests for Interpretation:

1. Prepare each request for interpretation on the "Request for Interpretation" form included with this Section, or other form acceptable to ENGINEER.

2. Number each request for interpretation as follows: Numbering system shall be the Contract number and designation followed by a hyphen and three-digit sequential number. Example: First request for interpretation on the general contract for project titled, "Contract A15" would be, "RFI No. A15-GC-001".
3. In space provided on form, describe the interpretation requested. Provide additional sheets as necessary. Include text and sketches as required in sufficient detail to describe the need for an interpretation.
4. When applicable, request for interpretation shall include CONTRACTOR's recommended resolution.

1.3 WRITTEN CLARIFICATIONS

A. General:
1. Written clarifications, when required, will be initiated and issued by ENGINEER.
2. Written clarifications do not change the Contract Price or Contract Times, and do not alter the Contract Documents.
3. Written clarifications will be issued as correspondence or using clarification notice form, with additional information as required.

B. Procedure.
1. ENGINEER's written clarifications will be transmitted in accordance with Section 01 31 26, Electronic Communication Protocols, and requirements of this Section.
2. Each written clarification will be distributed to:
   a. CONTRACTOR.
   b. DEPARTMENT.
   c. Resident Project Representative (RPR).
   d. ENGINEER.
3. Written Clarifications that One or Both Parties Believes Entails a Change to the Contract:
   a. If CONTRACTOR or DEPARTMENT believes that a change in the Contract Price or Contract Times or other change to the Contract is required as a result of ENGINEER's written clarification, so advise ENGINEER in writing before proceeding with the Work associated with the written clarification.
   b. If, after this initial communication, either DEPARTMENT or CONTRACTOR believes that change in Contract Price, Contract Times, both, or other relief with respect to the terms of the Contract is necessary, recourse shall be in accordance with the Contract Documents.
4. If ENGINEER's written clarification is unclear, prepare and transmit a request for interpretation.

1.4 MINOR CHANGES IN THE WORK AND FIELD ORDERS

A. General:
   1. Field Orders, when required, will be initiated and issued by ENGINEER.
   2. Field Orders authorize minor variations in the Work but do not change the Contract Price or Contract Times.
   3. Field Orders will be in the form of Engineers Joint Contract Documents Committee document EJCDC® C-942, "Field Order".
   4. ENGINEER will maintain a log of Field Orders issued.

B. Procedure.
   1. Field Orders will be transmitted in accordance with Section 01 31 26, Electronic Communication Protocols, and requirements of this Section. Each Field Order will include a separate letter of transmittal.
   2. Each Field Order will be distributed to:
      a. CONTRACTOR.
      b. DEPARTMENT.
      c. Resident Project Representative (RPR).
      d. ENGINEER.
   3. Field Orders that One or Both Parties Believes Entails a Change to the Contract Price or Contract Times:
      a. If CONTRACTOR or DEPARTMENT believes that a change in the Contract Price or Contract Times or other change to the Contract is required as a result of a Field Order, so advise ENGINEER in writing before proceeding with the Work associated with the Field Order.
      b. If, after this initial communication, CONTRACTOR believes that change in Contract Price, Contract Times, both, or other relief with respect to the terms of the Contract is necessary, recourse shall be in accordance with the Contract Documents.
   4. If the Field Order is unclear, submit request for interpretation.

1.5 WORK CHANGE DIRECTIVES

A. General:
   1. Work Change Directives, when required, order additions, deletions, or revisions to the Work.
   2. Work Change Directives do not change the Contract Price or Contract Times but are evidence that the parties to the Contract expect that the change ordered or documented by the Work Change Directive will be incorporated in subsequently issued Change Order following agreement by the parties as to the Work Change Directive's effect, if any, on the Contract Price or Contract Times.
   3. Work Change Directives will be in the form of EJCDC® C-940, "Work Change Directive".

B. Procedure.
   1. Work Change Directives signed by DEPARTMENT and ENGINEER will be transmitted in accordance with Section 01 31 26, Electronic Communication Protocols, and requirements of this Section. Each Work Change Directive will include a separate letter of transmittal. CONTRACTOR shall print three originals of Work Change Directive for CONTRACTOR's signature.
   2. CONTRACTOR shall promptly sign each original Work Change Directive and, within five days of receipt, return all originals to ENGINEER.
   3. Original, signed Work Change Directives will be distributed as follows:
      a. CONTRACTOR: One original.
      b. DEPARTMENT: One original.
      c. ENGINEER: One original.
   4. One copy of each Work Change Directive will be distributed to:
      a. Resident Project Representative (RPR).
   5. Documentation of Costs:
      a. When basis of payment for Work ordered under a Work Change Directive will be paid as Cost of the Work, or when otherwise required by ENGINEER, document for the Work performed under each separate Work Change Directive, for each day, the following:
         1) Number and labor classifications of workers employed and hours worked.
         2) Construction equipment used including manufacturer, model, and year of manufacture, and number of hours such equipment was onsite and used for the Work under the Work Change Directive.
         3) Consumables and similar materials used.
         4) Receipts, bills, or invoices for and descriptions of materials and equipment incorporated into the Work.
         5) Invoices and labor and equipment breakdowns for Subcontractors and Suppliers.
         6) Other information required by DEPARTMENT or ENGINEER,
      b. Submit such information in a format acceptable to ENGINEER.
      c. Transmit such documentation to ENGINEER as a Change Proposal.

1.6 PROPOSAL REQUESTS

A. General:
   1. Proposal Requests may be initiated by ENGINEER or DEPARTMENT.
   2. Proposal Requests are for requesting the effect on the Contract Price and the Contract Times and other information relative to contemplated changes in the Work. Proposal Requests do not authorize changes or variations in the Work, and do not change the Contract Price or Contract Times or terms of the Contract.
   3. Proposal Requests will be furnished using the "Proposal Request" form included with this Section.

B. Procedure.
   1. Proposal Requests will be transmitted in accordance with Section 01 31 26, Electronic Communication Protocols, and requirements of this Section. Each Proposal Requests will include a separate letter of transmittal.
   2. Each signed Proposal Request will be transmitted to:
      a. CONTRACTOR.
      b. DEPARTMENT.
      c. Resident Project Representative (RPR).
      d. ENGINEER.
   3. Transmit request for interpretation to clarify conflicts, errors, ambiguities, and discrepancies in Proposal Request.
   4. Upon receipt of Proposal Request, CONTRACTOR shall prepare and transmit to ENGINEER a Change Proposal, in accordance with the Contract Documents, for the proposed Work described in the Proposal Request.

1.7 CHANGE PROPOSALS

A. General.
   1. Prepare and transmit written Change Proposal to ENGINEER in response to each Proposal Request; or when CONTRACTOR believes a change in the Contract Price or Contract Times or other change to the terms of the Contract is required; or to appeal an initial decision by ENGINEER concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under the Contract.

B. Procedure.
   1. Prepare and transmit Change Proposals within time limits indicated in the General Conditions, as may be modified by the Supplementary Conditions.
   2. Transmit Change Proposals in accordance with Section 01 31 26, Electronic Communication Protocols, and requirements of this Section. Include with each Change Proposal all required supporting documentation and a separate letter of transmittal.
   3. ENGINEER's Review and Requests for Additional Information:
      a. ENGINEER will review and act on each Change Proposal in accordance with, and within the time limits indicated in, the General Conditions, as may be modified by the Supplementary Conditions.
      b. When, ENGINEER requests additional information to render a decision, submit required information within five days of receipt of ENGINEER's request, unless ENGINEER allows more time. Submit the required information via correspondence that refers to the specific Change Proposal number.
      c. DEPARTMENT shall transmit to ENGINEER such comments, if any, that DEPARTMENT has on the Change Proposal, within 10 days of DEPARTMENT's receipt of the Change Proposal.
      d. ENGINEER will render a written decision on the Change Proposal.

e. ENGINEER's response to Change Proposals will be transmitted in accordance with Section 01 31 26, Electronic Communication Protocols, and requirements of this Section, the General Conditions, and the Supplementary Conditions.

4. ENGINEER's response to each Change Proposal will be distributed to:
   a. CONTRACTOR.
   b. DEPARTMENT.
   c. Resident Project Representative (RPR).
   d. ENGINEER.
5. If Change Proposal is recommended for approval by ENGINEER and is approved by DEPARTMENT, a Change Order will be issued or, when applicable, an appropriate use of contingency allowance will be authorized by DEPARTMENT.
6. If parties do not agree on terms for the change, DEPARTMENT or CONTRACTOR may file a Claim against the other, in accordance with the General Conditions, as may be modified by the Supplementary Conditions.

C. Preparation of Change Proposals:
   1. Each Change Proposal shall be submitted on the "Change Proposal" form included with this Section, or other form acceptable to ENGINEER.
   2. Number each Change Proposal as follows: Numbering system shall be the Contract number and designation followed by a hyphen and three-digit sequential number. Example: First Change Proposal for the general contract for project named "Contract A15" would be, "Change Proposal No. A15-GC-001".
   3. In space provided on Change Proposal form:
      a. Describe scope of each proposed change. Include text and sketches on additional sheets as required to provide detail sufficient for ENGINEER's review and response. If a change item is submitted in response to Proposal Request, write in as scope, "In accordance with Proposal Request No." followed by the Proposal Request number. Submit written clarifications, if any, to scope of change.
      b. Submit justification for each proposed change. If change is in response to proposal request, write in as justification, "In accordance with Proposal Request No." followed by the proposal request number.
      c. List the total change in the Contract Price and Contract Times for each separate change item included in the Change Proposal.
   4. Unless otherwise directed by ENGINEER, attach to the Change Proposal detailed breakdowns of pricing (Cost of the Work and CONTRACTOR's fee) including:
      a. List of Work tasks to accomplish the change.
      b. For each task, labor cost breakdown including labor classification, total hours per labor classification, and hourly cost rate for each labor classification.

c. Construction equipment and machinery to be used, including manufacturer, model, and year of manufacture, and number of hours for each.
d. Detailed breakdown of cost of materials and equipment to be incorporated into the Work, including quantities, unit costs, and total cost, with Supplier's written quotations.
e. Breakdowns of the Cost of the Work and fee for Subcontractors, including labor, construction equipment and machinery, and materials and equipment incorporated into the Work, other costs, and Subcontractor fees (e.g., overhead and profit).
f. Breakdown of other costs eligible, in accordance with the General Conditions and the Supplementary Conditions under "Cost of the Work" provisions.
g. Other information required by ENGINEER.
h. CONTRACTOR's fees applied to eligible CONTRACTOR costs and eligible Subcontractor costs.

1.8 CHANGE ORDERS

A. General:
1. Change Orders will be recommended by ENGINEER (when required by the General Conditions), and will be signed by DEPARTMENT and CONTRACTOR, to authorize additions, deletions, or revisions to the Work, or changes to the Contract Price or Contract Times.
2. Change Orders will be in the form of EJCDC® C-941, "Change Order".

B. Procedure.
1. Change Orders for signature by CONTRACTOR will be transmitted in accordance with Section 01 31 26, Electronic Communication Protocols, and requirements of this Section. Each Change Order will include a separate letter of transmittal. CONTRACTOR shall print three originals of Change Order for CONTRACTOR's signature.
2. CONTRACTOR shall promptly sign each original Change Order and, within five days of receipt, return all originals to ENGINEER.
3. ENGINEER will sign each original Change Order and forward them to DEPARTMENT.
4. After approval and signature by DEPARTMENT, original Change Orders will be distributed as indicated below.
5. Original, signed Change Orders will be distributed as follows:
   a. CONTRACTOR: One original.
   b. DEPARTMENT: One original.
   c. ENGINEER: One original.
6. One copy of each Change Order will be distributed to:
   a. Resident Project Representative (RPR).

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 ATTACHMENTS

A. The forms listed below, following this Section's "End of Section" designation, are part of this Specifications Section:
   1. Request for Interpretation form (one page).
   2. Proposal Request form (one page).
   3. Change Proposal form (one page).

+ + END OF SECTION + +

REQUEST FOR INTERPRETATION

DEPARTMENT: _____

Project Name: _____

Contractor: _____ RFI No. _____

Date Transmitted: _____ Date Received: _____

Date Response Requested: _____ Date Response Transmitted: _____

Subject: _____

Specification Section and Paragraph: _____

Drawing References: _____

INTERPRETATION REQUESTED:

Signature: _____ Date: _____

ENGINEER'S RESPONSE:

Signature: _____ Date: _____

PROPOSAL REQUEST

DEPARTMENT: _____

Project Name: _____

Proposal Request No.: _____ Date: _____

Contract Name and No.: _____

Contractor: _____

Other Contracts Involved in Proposed Change: _____

_____

TO CONTRACTOR: Please submit a complete Change Proposal for the proposed modifications described below. If the associated Change Proposal is approved, a Change Order or allowance authorization will be issued to authorize adjustment so the scope of the Work. This Proposal Request is not a Change Order, Work Change Directive, Field Order, or an authorization to proceed with the proposed Work described below.

SCOPE OF PROPOSED WORK:

1. *Item*:
2. *Item*:
3. *Item*:

Proposal requested by: _____

Signature of Requestor: _____

CHANGE PROPOSAL

Project Name: _____

Change Proposal No.: _____ Date: _____

Submitted in Response to Proposal Request No.: _____

Contract Name and No.: _____
Contractor: _____

Subject: _____
_____

The following changes to the Contract are proposed:

SCOPE OF WORK: *(attach and list supporting information as required)*

1. *Item*:
2. *Item*:

JUSTIFICATION:

1. *Item*:
2. *Item*:

CHANGES IN CONTRACT PRICE AND CONTRACT TIMES:

We propose that the Contract Price and Contract Times be changed as follows:

For Contract Price, attach detailed cost breakdowns for Contractor and Subcontractors, Supplier quotations, and other information required.

For the Contract Times, state increase, decrease, or no change to Contract Times for Substantial Completion, readiness for final payment, and Milestones, if any. If increase or decrease, state specific number of days for changes to the Contract Times.

Description	Amount	Contract Times (days)	
		Substantial	Final
1. Item	$0.00	0	0
2. Item	$0.00	0	0
Total This Change Proposal	**$0.00**	**0**	**0**

Changes to Milestones, if any: _____

Contractor represents that supporting data attached to this Change Proposal are accurate and complete. The requested time or price adjustment indicated in this Change Proposal is the entire adjustment to which Contractor believes it is entitled as a result of the proposed change(s) indicated herein.

Change Proposal by: _____

Signature of Proposer: _____

SECTION 01 29 73

SCHEDULE OF VALUES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall prepare and submit to ENGINEER for acceptance a Schedule of Values that allocates cost to each item of the Work. Schedule of Value list of line items shall correspond to each aspect of the Work, establishing in detail the portion of the Contract Price allocated to each major component of the Work.
   2. Upon request of ENGINEER, support values with data that substantiate their correctness.
   3. Submit preliminary Schedule of Values to ENGINEER for initial review. CONTRACTOR shall incorporate ENGINEER's comments into the Schedule of Values and resubmit to ENGINEER. ENGINEER may require corrections and re-submittals until Schedule of Values is acceptable.
   4. Schedule of Values may be used as a basis for negotiating price of changes, if any, in the Work.
   5. Schedule of Values and the Progress Schedule updates specified in Section 01 32 16, Progress Schedule, will be basis for preparing each Application for Payment.

1.2 SUBMITTALS

A. Informational Submittals: Submit the following:
   1. Submit to ENGINEER Schedule of Values in the form and quantity required in Section 01 33 00, Submittal Procedures, and in accordance with Section 01 31 26, Electronic Communication Protocols.
   2. Content of Schedule of Values submittals shall be in accordance with Article 1.3 of this Section.
   3. Timing of Submittals:
      a. Submit preliminary Schedule of Values within ten days following the date that the Contract Times commence running in accordance with the Purchase Order.
      b. Submittal of the Schedule of Values for acceptance by ENGINEER. ENGINEER will not accept Applications for Payment without an acceptable Schedule of Values.
      c. When required by ENGINEER, promptly submit updated Schedule of Values to include cost breakdowns for changes in the Contract Price.

1.3 SCHEDULE OF VALUES FORMAT AND CONTENT

A. Organization and Major Elements of Schedule of Values
   1. Prepare Schedule of Values on the "progress estimate" or "continuation sheets", as applicable, of the Application for Payment form provided by the DEPARTMENT.
   2. Organization in Accordance with Specification Sections:
      a. Within each work area, organize the Schedule of Values by the various Specifications Section numbers and titles included in the Contract Documents.
      b. Label each row in the Schedule of Values with the appropriate Specifications Section number. Include an amount for each row in the Schedule of Values.
      c. List sub-items of major products or systems, as appropriate or when requested by ENGINEER.
   3. Include in Schedule of Values unit price payment items with their associated quantity. Provide in the Schedule of Values detailed breakdown of unit prices when required by ENGINEER.

B. Requirements for preliminary Schedule of Values and Schedule of Values are:
   1. Subcontracted Work:
      a. Schedule of Values shall show division of Work between CONTRACTOR and Subcontractors.
      b. Line items for Work to be done by Subcontractor shall include the word, "(SUBCONTRACTED)".
   2. Apportionment between Materials and Equipment, and Installation:
      a. Schedule of Values shall include breakdown of costs for materials and equipment, installation, and other costs used in preparing the Bid by CONTRACTOR and each Subcontractor.
      b. List purchase and delivery costs for materials and equipment for which CONTRACTOR may apply for payment as stored materials.
   3. Sum of individual values shown on the Schedule of Values shall equal the total of associated payment item. Sum of payment item totals in the Schedule of Values shall equal the Contract Price.
   4. Overhead and Profit: Include in each line item a directly proportional amount of CONTRACTOR's overhead and profit. Do not include overhead and profit as separate item(s).
   5. Include separate line item for each allowance, and for each unit price item.
   6. Bonds and Insurance Costs: Include line item for bonds and insurance in payment item for Item 1, in amount not exceeding 2.0 percent of the Contract Price. This amount may be applied for in the first Application for Payment.
   7. Include relevant items for the General Conditions, permits (when applicable), construction Progress Schedule, and other items required by ENGINEER. Include such items in Applications for Payment on payment schedule acceptable to ENGINEER

8. Line items for Site maintenance such as dust control, snow removal, compliance with storm water pollution prevention plans and permits, spill prevention control and countermeasures plans, and for construction photographic documentation; temporary utilities and temporary facilities, field offices, temporary controls, field engineering, and similar Work shall be included in the Schedule of Values and proportioned in Applications for Payment throughout duration of the Work.
9. Mobilization and Demobilization:
    a. Include separate line items under each appropriate payment item for mobilization and demobilization. Document for ENGINEER the activities included in mobilization and demobilization line items.
    b. Mobilization will be limited to 2.0 percent of the Contract Price, and will be paid in one payment.
    c. Demobilization shall be not less than 1.0 percent of the Contract Price and shall be included with the Application for Payment following Substantial Completion, or other schedule acceptable to ENGINEER.
10. Costs for Shop Drawings, Samples, and other submittals; operations and maintenance manuals; field testing; and training of operations and maintenance personnel shall be as follows, unless otherwise accepted by ENGINEER:
    a. Up to eight percent of cost (including all associated overhead and profit) of each equipment item, exclusive of transportation and installation costs associated with that item, may be allocated to preparation of Shop Drawings, Samples, and other submittals and may be included in the Application for Payment following ENGINEER's approval of Shop Drawings (and acceptance of other submittals, as applicable) required for fabricating or purchasing for that item for the Work.
    b. Up to three percent of total cost of each item (including all associated overhead and profit), including materials and equipment, and installation, may be apportioned to testing and included in the Application for Payment following ENGINEER's acceptance of the associated written field testing report(s).
    c. Up to a total of four percent of equipment cost (including all associated overhead and profit), exclusive of transportation and installation costs, may be apportioned to operations and maintenance manuals and training of operations and maintenance personnel, which may be included in the Application for Payment following completion of training for that item.
11. Project Record Documents:
    a. Include in the Schedule of Values a line item with appropriate value for Project record documents.
    b. If adequate record documents are maintained, up to 50 percent of the value of the record documents line item will be eligible for payment, spread evenly over those progress payments in which construction at the Site is performed.
    c. Remainder of Project record documents line item will be eligible for payment when complete record documents are submitted in accordance with the Contract Documents. If record documents submitted are

unsatisfactory to ENGINEER, amount may be reduced via set-offs in accordance with the Contract Documents.

12. Schedule of Values shall include an itemized list of Work by work area, as applicable, for Work included in Section 01 14 16, Coordination with Owner's Operations.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 31 16

MULTIPLE CONTRACT COORDINATION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Prime Contractors:
      a. Prime CONTRACTORS shall coordinate their work and cooperate among themselves as required for satisfactory, expeditious completion of the Project (i) within the Contract Times, (ii) in accordance with the Progress Schedule, and (iii) in accordance with the Contract Documents.
      b. Prime contracts for the Project are indicated in Section 01 12 13, Summary of Work.
      c. Additional requirements regarding coordination among prime contractors are in the General Conditions and elsewhere in the Contract Documents
   2. Subcontractors and Suppliers:
      a. Prime CONTRACTORS shall coordinate and cooperate fully with their own Subcontractors and Suppliers and others whose services, materials, or equipment, are required to complete their Work in accordance with the Contract Documents.
      b. Additional requirements regarding prime CONTRACTORS' responsibility for coordinating and scheduling their Subcontractors and Suppliers are in the General Conditions and elsewhere in the Contract Documents.
   3. Work by Others:
      a. In accordance with the General Conditions as may be modified by the Supplementary Conditions, prime CONTRACTORS, shall cooperate with, and coordinate their Work with, contractors on DEPARTMENT or CITY's other projects, utility owners and utility service companies, DEPARTMENT's and CITY's employees working at the Site, and other entities working at the Site, in accordance with Section 01 12 13, Summary of Work.

B. Coordination:
   1. Each prime CONTRACTOR shall review the Progress Schedule and installation procedures under other Specifications Sections and other prime contracts that may affect their Work, and coordinate installation of such work with appropriate entity or entities.
   2. General CONTRACTOR shall provide openings in concrete formwork and in other construction as required to accommodate the Work under other Specifications Sections and the work of other contractors, assist other contractors in installing "built-in" items required for other contractors' work,

and protect such "built-in" items and other work of other contractors from damage.

3. Prime CONTRACTORS shall notify ENGINEER in writing if prime CONTRACTOR believes that another contractor is failing to coordinate its work with work of other contractors. ENGINEER will promptly investigate the charge and ENGINEER will issue such clarifications and interpretations to other contractor(s) as the situation requires.
4. Should a prime CONTRACTOR suffer loss, damages, delay, or require other relief with respect to the terms of the Contract Documents because of the actions or inactions of another contractor working for DEPARTMENT at the Site, said prime CONTRACTOR shall prepare and transmit a Change Proposal in accordance with the Contract Documents. DEPARTMENT may in turn file a Claim against the infringing contractor, in accordance with the Contract Documents.
5. Neither DEPARTMENT nor ENGINEER guarantee continuous efficiency of prime contractors.

C. Layout and Coordination Drawings:
1. Prime CONTRACTORS shall maintain at the Site sufficient competent personnel for preparing layout drawings and coordination drawings. Where such drawings are to be prepared by Subcontractors, the Subcontractor shall have required personnel at the Site.
2. Each prime CONTRACTOR shall provide CONTRACTOR's own drafting equipment, computer hardware, systems, software, and supplies.
3. Prime CONTRACTORS shall share coordination drawings among themselves.
4. Promptly furnish coordination drawings to the ENGINEER when requested.

1.2 QUALITY ASSURANCE

A. Coordination Meetings:
1. Coordination meetings shall be held on a weekly basis, unless mutually agreed by the prime CONTRACTORS, ENGINEER, and other interested or involved entities that another schedule is suitable.
2. Site Mobilization Meeting:
   a. Initial meeting will be the Site mobilization meeting (unless such meeting is held as part of the preconstruction conference) and will be held within ten days after the Contract Times commence running.
   b. At the Site mobilization meeting, prime CONTRACTORS, DEPARTMENT, City, and ENGINEER, when such decisions have potential to affect the completed Project, will make decisions on allocations of space at the Site, construction requirements, and future coordination meetings.
   c. A preliminary agenda of topics to be covered at the Site mobilization meeting is indicated in Section 01 31 19.13, Preconstruction Conference.
   d. ENGINEER will advise each prime CONTRACTOR of the time, place, and tentative agenda for the Site mobilization meeting.

3. Coordination Meetings during the Project:
   a. Purposes of coordination meetings include:
      1) Establishing and modifying work schedules and achieving agreement on orderly sequences of operations acceptable to all prime contractors.
      2) Reviewing and adjusting conflicts, work arrangements, and schedules to reduce the potential for and avoid delays and work stoppages.
      3) Discussing and accepting coordination drawings prepared by each prime CONTRACTOR, as required to assist and guide others.
   b. ENGINEER will advise each prime CONTRACTOR of the time, place, and tentative agenda of coordination meetings.
4. General (applicable to all meetings required under his Section):
   a. Scheduling:
      1) Meetings required under this Section will be arranged through ENGINEER and shall be separate from and in addition to progress meetings.
      2) If a prime CONTRACTOR cannot, for compelling reasons, attend a coordination meeting, prime CONTRACTOR shall advise other prime contractors and ENGINEER in writing in a timely manner, so that meeting may be rescheduled.
      3) Any prime CONTRACTOR may initiate a coordination meeting by addressing request to ENGINEER.
   b. Records of Meetings:
      1) ENGINEER will keep notes, records, and write minutes of meetings required under this Section, and distribute to meeting attendees and others as appropriate, including DEPARTMENT, CITY and Resident Project Representative (RPR).
   c. Attendees:
      1) Each prime CONTRACTOR shall have a representative present at each meeting required under this Section.
      2) ENGINEER shall attend each meeting required under this Section.
      3) DEPARTMENT, CITY and RPR may attend coordination meetings, but their attendance is not mandatory.
   d. Representatives:
      1) Representatives of prime CONTRACTORS at meetings required under this Section shall have competence and authority to make necessary decisions.
      2) Representatives' decisions and statements shall commit the associated prime CONTRACTOR to the agreed procedures, sequence of operations, and schedules.
   e. Failure to be represented at one or more meetings required under this Section will cause absent prime CONTRACTOR(s) to be liable for damages, delays, costs of alterations, and other costs that result because CONTRACTOR was not present to arrange coordination of their Work with other construction activities.
   f. Where procedures have been agreed upon and coordination drawings accepted by prime CONTRACTORS concerned, coordination drawings

and procedures shall become binding on prime CONTRACTORS concerned relative to time and performance. Such drawings do not, however, take precedence over the Contract Documents.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 31 19.13

PRE-CONSTRUCTION CONFERENCE

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. A pre-construction conference will be held for the Project.
   2. CONTRACTOR shall attend the conference prepared to discuss all items on the pre-construction conference agenda.
   3. ENGINEER will distribute an agenda, preside at conference, and prepare and distribute minutes to all conference participants and others as requested.

B. Purpose of Pre-construction Conference:
   1. Purpose of conference is to designate responsible personnel, establish working relationships, discuss preliminary schedules submitted by CONTRACTOR, and review administrative and procedural requirements for the Project.
   2. Matters requiring coordination will be discussed and procedures for handling such matters will be established.
   3. Unless otherwise indicated in the Contract Documents or otherwise agreed to by the entities involved, Site mobilization meeting will be part of the pre-construction conference.

1.2 PREPARATION FOR PRE-CONSTRUCTION CONFERENCE

A. Date, Time, and Location:
   1. Conference will be held after execution of the Contract and before Work starts at the Site.
   2. ENGINEER will establish the date, time, and location of conference and notify the interested and involved entities.

B. Submittals Required Prior to Pre-construction Conference:
   1. Not less than three days prior to pre-construction conference, submit the following preliminary schedules in accordance with the Agreement and other requirements of the Contract Documents:
      a. Preliminary Progress Schedule.
      b. Preliminary Schedule of Submittals.
      c. Preliminary Schedule of Values.
      d. Listing of identity and general scope of Work or supply (as applicable) of planned Subcontractors and Suppliers. Indicate extent of each Subcontract proposed and overall percentage of Contract Price to be subcontracted.

C. CONTRACTOR shall furnish information required and contribute appropriate items for discussion at the pre-construction conference.

D. Handouts for Pre-Construction Conference:
   1. CONTRACTOR shall bring to the conference the following, with sufficient number of copies for each attendee:
      a. Preliminary Progress Schedule, as submitted to ENGINEER.
      b. Preliminary Schedule of Submittals, as submitted to ENGINEER.
      c. Preliminary Schedule of Values, as submitted to ENGINEER.
      d. Listing of identity and general scope of Work or supply of planned Subcontractors and Suppliers.
      e. List of emergency contact information, in accordance with Article 1.5 of Section 01 35 23, Safety Requirements.

1.3 REQUIRED ATTENDEES

A. Representative of each entity attending the conference shall be authorized to act on that entity's behalf.

B. Contractor Attendance: Conference shall be attended by CONTRACTOR's:
   1. Project manager.
   2. Site superintendent
   3. Project managers for major Subcontractors, and major equipment Suppliers as CONTRACTOR deems appropriate.

C. Other attendees will be representatives of:
   1. DEPARTMENT.
   2. ENGINEER.
   3. CITY.
   4. Resident Project Representative (RPR), if available.
   5. Authorities having jurisdiction over the Work, if available.
   6. Utility owners, as applicable.
   7. Others as requested by DEPARTMENT, CONTRACTOR, or ENGINEER.

1.4 AGENDA

A. Preliminary Agenda: Be prepared to discuss in detail the topics indicated below. Revisions, if any, to the agenda below will be furnished to required attendees prior to the pre-construction conference.
   1. Procedural and Administrative:
      a. Personnel and Teams:
         1) Designation of roles and personnel.
         2) Limitations of authority of personnel, including personnel who will sign Contract modifications and make binding decisions.
         3) Subcontractors and Suppliers in attendance.
         4) Authorities having jurisdiction.

b. Procedures for communications and correspondence, including electronic communication protocols.
c. Copies of the Contract Documents and availability.
d. Subcontractors and Suppliers.
   1) Lists of proposed Subcontractors and Suppliers.
e. The Work and Scheduling:
   1) General scope of the Work.
   2) Contract Times, including Milestones (if any).
   3) Phasing and sequencing.
   4) Preliminary Progress Schedule.
   5) Critical path activities.
f. Safety:
   1) Responsibility for safety.
   2) Contractor's safety representative.
   3) Emergency procedures and accident reporting.
   4) Emergency contact information.
   5) Confined space entry permits.
   6) Hazardous materials communication program.
   7) Impact of Project on public safety.
g. Permits.
h. Review of insurance requirements and insurance claims.
i. Coordination:
   1) Project coordination, and coordination among contractors.
   2) Construction coordinator.
   3) Coordination with CITY's operations.
   4) Progress meetings.
   5) Preliminary Schedule of Submittals.
   6) Procedures for furnishing and processing submittals.
   7) Work not eligible for payment until submittals are approved or accepted (as required).
   8) Construction photographic documentation.
j. Substitutes and "Or-Equals":
   1) Product options.
   2) Procedures for proposing "or-equals".
   3) Procedures for proposing substitutes.
k. Contract Modification Procedures
   1) Requests for interpretation
   2) Written clarifications
   3) Field Orders
   4) Proposal Requests
   5) Change Proposals
   6) Work Change Directives.
   7) Change Orders.
   8) Procedure for Claims and dispute resolution
l. Payment:
   1) DEPARTMENT's Project financing and funding, as applicable.

2) DEPARTMENT's tax-exempt status.
3) Preliminary Schedule of Values
4) Procedures for measuring for payment.
5) Retainage.
6) Progress payment procedures.
7) Prevailing wage rates and payrolls.

m. Testing and inspections, including notification requirements.
n. Disposal of demolition materials.
o. Record documents.
p. Preliminary Discussion of Contract Closeout:
1) Procedures for Substantial Completion.
2) Contract closeout requirements.
3) Correction period.
4) Duration of bonds and insurance.

2. Site Mobilization (if not covered in a separate meeting):
a. Working hours and overtime.
b. Field offices, storage trailers, and staging areas.
c. Temporary facilities.
d. Temporary utilities and limitations on utility consumption (where applicable).
e. Utility company coordination (if not done as a separate meeting).
f. Access to Site, access roads, and parking for construction vehicles.
g. Maintenance and protection of traffic.
h. Use of Site and premises.
i. Protection of property.
j. Security.
k. Temporary controls, such as sediment and erosion controls, noise controls, dust control, storm water controls, and other such measures.
l. Site barriers and temporary fencing.
m. Storage of materials and equipment.
n. Reference points and benchmarks; surveys and layouts.
o. Site maintenance during the Project.
p. Cleaning and removal of trash and debris.
q. Restoration.

3. General discussion and questions.
4. Next meeting.
5. Site visit, if required.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 31 19.23

PROGRESS MEETINGS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Progress meetings will be held throughout the Project. CONTRACTOR shall attend each progress meeting prepared to discuss in detail all items on the agenda.
   2. ENGINEER will preside at progress meetings and will prepare and distribute minutes of progress meetings to all meeting participants and others as requested.

1.2 PREPARATION FOR PROGRESS MEETINGS

A. Date and Time:
   1. Regular Meetings: Weekly on a day and time agreeable to DEPARTMENT, CITY, ENGINEER, and CONTRACTOR.
   2. Other Meetings: As required.

B. Location:
   1. CONTRACTOR's field office at the Site or other location mutually agreed upon by DEPARTMENT, CITY, CONTRACTOR, and ENGINEER.

C. Handouts:
   1. CONTRACTOR shall bring to each progress meeting not less than twelve copies of each of the following:
      a. List of Work accomplished since the previous progress meeting.
      b. Up-to-date Progress Schedule.
      c. Up-to-date Schedule of Submittals.
      d. Detailed "look-ahead" schedule of Work planned through the next progress meeting, with specific starting and ending dates for each activity, including shutdowns, deliveries of important materials and equipment, Milestones (if any), and important activities affecting the DEPARTMENT, Project, and Site.
      e. When applicable, list of upcoming, planned time off (with dates) for personnel with significant roles on the Project, and the designated contact person in their absence.

1.3 REQUIRED ATTENDANCE

A. Representatives present for each entity shall be authorized to act on that entity's behalf.

B. Required Attendees:
   1. CONTRACTOR:
      a. Project manager.
      b. Site superintendent.
      c. Safety representative.
      d. When needed for the discussion of a particular agenda item, representatives of Subcontractors and Suppliers shall attend meetings.
   2. ENGINEER:
      a. Project manager or designated representative
      b. Resident Project Representative (if any).
      c. Others as required by ENGINEER.
   3. DEPARTMENT's representative(s), as required.
   4. CITY's representative(s), as required.
   5. Testing and inspection entities, as required.
   6. Others, as appropriate.

1.4 AGENDA

A. Preliminary Agenda: Be prepared to discuss in detail the topics listed below. Revised agenda, if any, will be furnished to CONTRACTOR prior to first progress meeting. Progress meeting agenda may be modified by ENGINEER during the Project as required.
   1. Review, comment, and amendment (if required) of minutes of previous progress meeting.
   2. Review of progress since the previous progress meeting.
   3. Planned progress through next progress meeting.
   4. Review of Progress Schedule
      a. Contract Times, including Milestones (if any)
      b. Critical path.
      c. Schedules for fabrication and delivery of materials and equipment.
      d. Corrective measures, if required.
   5. Submittals:
      a. Review status of critical submittals.
      b. Review revisions to Schedule of Submittals.
   6. Contract Modifications
      a. Requests for interpretation
      b. Written clarifications
      c. Field Orders
      d. Proposal Requests
      e. Change Proposals
      f. Work Change Directives.

g. Change Orders.
h. Claims.

7. Applications for progress payments.
8. Problems, conflicts, and observations.
9. Quality standards, testing, and inspections.
10. Coordination between parties.
11. Site management issues, including access, security, maintenance and protection of traffic, maintenance, cleaning, and other Site issues.
12. Safety.
13. Permits.
14. Construction photographic documentation.
15. Record documents status.
16. Punch list status, as applicable.
17. Other business.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

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SECTION 01 31 26

ELECTRONIC COMMUNICATION PROTOCOLS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section establishes the procedures with which the parties will comply regarding transmission or exchange of electronic data for the Project.
   2. CONTRACTOR shall provide labor, materials, tools, equipment, services, utilities, and incidentals shown, specified, and required for complying with this Section throughout the Project.
   3. In addition to the requirements of this Section, comply with requirements for exchange of electronic data in the following:
      a. Section 01 32 16, Progress Schedule.
      b. Section 01 32 33, Photographic Documentation.
      c. Section 01 33 00, Submittal Procedures.
      d. Section 01 78 39, Project Record Documents.

B. Coordination:
   1. CONTRACTOR shall require all Subcontractors and Suppliers to comply with the electronic communication protocols established in this Section.

C. Related Sections:
   1. Section 01 32 16, Progress Schedule.
   2. Section 01 32 33, Photographic Documentation.
   3. Section 01 33 00, Submittal Procedures.
   4. Section 01 78 39, Project Record Documents.

1.2 TERMINOLOGY

A. The following words or terms are not defined but, when used in this Section, have the following meaning:
   1. “Electronic data” means information, communications, drawings, or designs created or stored for the Project in electronic or digital form.
   2. “Confidential information” means electronic data that the transmitting party has designated as confidential and clearly marked with an indication such as “Confidential”, “Business Proprietary”, or similar designation.
   3. “Written” or “in writing” means any and all communications, including without limitation a notice, consent, or interpretation, prepared and sent to an address provided in the Contract Documents or otherwise agreed upon by the parties and ENGINEER using a transmission method sent forth in this Section that allows the recipient to print or store the communication.

Communications transmitted electronically are presumed received when sent in conformance with this Paragraph 1.2.A.3.

1.3 TRANSMISSION OF ELECTRONIC DATA

A. Transmission of electronic data constitutes a warrant by the transmitting party to the receiving party that the transmitting party is one or more of the following:
   1. The copyright owner of the electronic data.
   2. Has permission from the copyright owner to transmit the electronic data for its use on the Project.
   3. Is authorized to transmit confidential information.

B. Receiving party agrees to keep confidential information confidential and not to disclose it to another person except to (1) its employees, (2) those who need to know the content of the confidential information to perform services or construction solely and exclusively for the Project, or (3) its consultants, contractors, Subcontractors, and Suppliers whose contracts include similar restrictions on the use of electronic data and confidential information.

C. Transmitting party does not convey any right in the electronic data or in the software used to generate or transmit such data. Receiving party may not use electronic data unless permission to do so is provided in the Contract Documents, or in a separate license.

D. Unless otherwise granted in a separate license, receiving party's use, modification, or further transmission of electronic data, as provided the Contract Documents, is specifically limited to the design and construction of the Project in accordance with this Section, and nothing contained in this Section conveys any other right to use the electronic data for any other purpose.

E. To the fullest extent permitted by Laws and Regulations, receiving party shall indemnify and defend the transmitting party from and against all claims arising from or related to receiving party's modification to, or unlicensed use of, electronic data.

F. Means of Transmitting Electronic Data: Unless otherwise indicated in Table 01 31 26-A of this Section or elsewhere in the Contract Documents, transmission of electronic data for the Project will generally be via:
   1. E-mail and files attached to e-mail. Maintain e-mail system capable of transmitting and receiving files not less than 20 megabytes (MB) file size.

1.4 ELECTRONIC DATA PROTOCOLS

A. Comply with the data formats, transmission methods, and permitted uses set forth in Table 01 31 26-A, Electronic Data Protocol Table, below, when transmitting or using electronic data on the Project. Where a row in the table has no indicated means of

transmitting electronic data, use for such documents only printed copies transmitted to the receiving party via appropriate delivery method.

TABLE 01 31 26-A
ELECTRONIC DATA PROTOCOL TABLE (E-MAIL ATTACHMENTS)

Electronic Data	Data Format	Transmitting Party	Transmission Method	Receiving Party	Permitted Uses	Notes
1.4.A.1. Project communications						
General communications & correspondence	EM, PDF	O, E, C	EM, EMA	O, E, C	R	
Meeting notices and agendas	EM, PDF	E	EM, EMA	O, C	R	
Meeting minutes	PDF	E	EM, EMA	O, C	R	
1.4.A.2. Contractor's submittals to Engineer						
Shop Drawings	PDF	C	PW	E	M (1)	(1)
Product data	PDF	C	PW	E	M (1)	(1)
Informational and closeout submittals:	PDF	C	PW	E	M (1)	(1) (6)
Documentation of delivery of maintenance materials submittals	PDF	C	PW	E	M (1)	
1.4.A.3. Engineer's return of reviewed submittals to Contractor						
Shop Drawings	PDF	E	PW	O., C	R	
Product data	PDF	E	PW	O., C	R	
Informational and closeout submittals:	PDF	E	PW	O., C	R	(6)
Documentation of delivery of maintenance materials submittals	PDF	E	PW	O. C	R	
1.4.A.4. Contract Modifications Documents						
Requests for interpretation to Engineer	PDF	C., O	EMA	E	M (1)	(1)
Engineer's interpretations (RFI responses)	PDF	E	EMA	C, O	R	
Engineer's clarifications to Contractor	EM, PDF	E	EM, EMA	C, O	R	
Engineer's issuance of Field Orders	PDF	E	EMA	C, O	R	
Proposal Requests	PDF	E, O	EMA	C	R	
Change Proposals – submitted to Engineer	PDF	C	EMA	O, E	S	
Change Proposals – Engineer's response	PDF	E	EMA	C. O		
Work Change Directives (for Contractor signature)	PDF	E	EMA	C	R	(2)
Change Orders (for Contractor signature)	PDF	E	EMA	C	R	(2)
1.4.A.5. Applications for Payment						(3)
1.4.A.6. Claims and other notices						(4)
1.4.A.7. Closeout Documents						
Record drawings	DWG and PDF	C	EMA	E, O	M (5)	(5)
Other record documents	PDF	C	EMA	E. O	M (5)	(5)
Contract closeout documents						

B. Key to Electronic Data Protocol Table:

Data Format:

EM .msg, .htm, .txt, .rtf, e-mail text
W .docx, Microsoft® Word 2007 or later
EX .xlsx, Microsoft® Excel 2007 or later
PDF .pdf. Portable Document Format
DWG .dwg. Autodesk AutoCAD 2013 drawing.

Transmitting Party:

O	DEPARTMENT
C	CONTRACTOR
E	ENGINEER

Transmission Method:

EM	Via e-mail
EMA	As an attachment to an e-mail transmission
CD	Delivered via compact disc
PW	Posted to Project website
FTP	FTP transfer to receiving FTP server

Receiving Party:

O	DEPARTMENT
C	CONTRACTOR
E	ENGINEER

Permitted Uses:

S	Store and view only
R	Reproduce and distribute
I	Integrate (incorporate additional electronic data without modifying data received)
M	Modify as required to fulfill obligations for the Project

Notes:

(1) Modifications by ENGINEER to CONTRACTOR's submittals and requests for interpretations are limited to printing out, marking-up, and adding comment sheets.

(2) May be distributed only to affected Subcontractors and Suppliers. Print out, sign document, and return executed printed copy originals to ENGINEER.

(3) Submit printed Applications for Payment with original ("wet") signatures.

(4) Submit notices, including Claims, in accordance with the notice provisions of the General Conditions, as may be modified by the Supplementary Conditions.

(5) Submit record drawings in native CAD format indicated when CONTRACTOR has executed ENGINEER's standard agreement for release of electronic files. In addition, always submit record drawings as a PDF file. Comply with requirements of Section 01 78 39, Project Record Documents.

(6) For operation and maintenance data, also submit printed copies as required by Section 01 78 23, Operations and Maintenance Data.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

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SECTION 01 32 16.00.30

PROGRESS SCHEDULE

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. General CONTRACTOR shall prepare and submit Progress Schedules and related documents in accordance with the General Conditions, as may be modified by the Supplementary Conditions, and this Section, unless otherwise accepted by ENGINEER.
   2. Prime contractors engaged on the Project, other than the General CONTRACTOR, shall promptly furnish information to General CONTRACTOR and ENGINEER, as indicated, for preparing and updating Progress Schedules and related documents at coordination meetings as required by Section 01 31 16, Multiple Contract Coordination.
   3. Maintain and update Progress Schedules and related documents.
   4. Progress Schedule shall be resource-and cost-loaded CPM Progress Schedule.
   5. ENGINEER's acceptance of the Progress Schedule or related documents, and comments or opinions concerning activities in the Progress Schedule and related documents shall not control independent judgment of CONTRACTOR concerning means, methods, techniques, sequences and procedures of construction, unless the associated means, method, technique, sequence, or procedure is directed by the Contract Documents. CONTRACTOR is solely responsible for complying with the Contract Times.

B. Use of Float:
   1. Float belongs to the Project and may be used by DEPARTMENT or any CONTRACTOR to accommodate changes in the Work, or to mitigate the effect of events that delay performance or compliance with the Contract Times.
   2. Changes or delays that influence Activities that have Float and that do not extend the Critical Path are not justification for an extension of the Contract Times.

C. Factors Affecting the Progress Schedule:
   1. In preparing and maintaining the Progress Schedule, take into consideration submittal requirements and submittal review times, coordination of submittals among contractors, time for fabricating and delivering materials and equipment, source quality control (including shop testing) and field quality control (including testing at the Site), Subcontractors' work, availability and abilities of workers, availability of construction equipment, weather conditions, restrictions in operations at the Site and coordination with CITY's operations,

and other factors that have the potential to affect completion of the Work within the Contract Times.

2. Comply with sequencing requirements indicated in the following:
   a. Section 01 12 13, Summary of Work.
   b. Section 01 13 13, Milestones.
   c. Section 01 14 16, Coordination with CITY's Operations.

1.2 DEFINITIONS AND TERMINOLOGY

A. Definitions: The following terms are defined for this Section and supplement the terms defined in the General Conditions and Supplementary Conditions:
   1. Activity: An element of the construction work that has the following specific characteristics: consumes time, consumes resources, has a definable start and finish, is assignable, and is measurable.
   2. Constraint: An imposed date on the Progress Schedule or an imposed time between Activities. The Contract Times are Constraints.
   3. CPM Progress Schedule: Computerized Progress Schedule in Critical Path Method (CPM) format which accounts for the entire Work, defines the interrelationships between elements of the Work, reflects the uncompleted Work, and indicates the sequence with which the Work has been completed, indicates the sequence in which uncompleted Work will be completed, and indicates the duration of each Activity.
   4. Critical Path: The continuous chain of Activities with the longest duration for completion within the Contract Times.
   5. Early Start: The earliest possible date an Activity can start according to the assigned relationships among Activities.
   6. Early Finish: The earliest date an Activity can finish according to the assigned relationships among the Activities.
   7. Late Finish: The latest date an Activity can finish without extending the Contract Times.
   8. Late Start: The latest date an Activity can start without extending the Contract Times.
   9. Float: The time difference between the calculated duration of the Activity chain and the Critical Path.
   10. Total Float: The total number of days that an Activity (or chain of Activities) can be delayed without affecting the Contract Times.
   11. Network Diagram: A time-scaled logic diagram depicting the durations and relationships of the Activities.
   12. Work Areas, Area, or System: A logical breakdown of the Project elements or a group of Activities which, when collectively assembled, are readily identifiable on the Project (for example: yard piping, a structure or building, a treatment process, or other logical grouping).

B. Terminology: The following words or terms are not defined but, when used in this Section, have the following meaning:
   1. "Prime contractor" is an individual or entity with whom DEPARTMENT has entered into a contract to perform part of the Project.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Progress Schedule Preparer:
      a. General CONTRACTOR shall retain services of a scheduling consultant or shall self-prepare and maintain the Progress Schedule using qualified employee with experience in scheduling, and experience with the scheduling software required for the Project, and experience serving as Progress Schedule preparer on construction projects of similar type, size, and scope to the Project, and shall be experienced on projects with multiple prime contracts.
      b. Progress Schedule preparer shall have not less than five years' experience using the scheduling software required on construction projects of similar type, size, and scope as the Project.
      c. Prior to engaging a scheduling consultant or using a qualified employee, submit to ENGINEER the following:
         1) Name and address of proposed Progress Schedule preparer and the names of personnel who will be assigned to scheduling the Project.
         2) Information sufficient to demonstrate that proposed Progress Schedule preparer and scheduling personnel to be assigned to the Project possess qualifications complying with requirements of this Section. For each person assigned, submit list of similar type, size, contract value of projects, names and contact information of engineer or architect and owner.
      d. Engineer's Review of Qualifications:
         1) ENGINEER will respond to General CONTRACTOR whether proposed scheduling personnel are acceptable within five days after ENGINEER's receipt of complete qualifications.
         2) If qualifications are not acceptable, submit qualifications of acceptable personnel within five days of receipt of ENGINEER's non-acceptance.
         3) ENGINEER's acceptance or non-acceptance of qualifications does not release General CONTRACTOR from its obligations under the Contract Documents.

B. Scheduling Workshop Conferences:
   1. Prior to preparing the preliminary Progress Schedule, General CONTRACTOR and all other prime contractors on the Project shall meet with ENGINEER for one workshop conference, each up to 4 hours in duration, to review technical requirements and Progress Schedule development methods and procedures.

2. Required Attendance:
    a. General CONTRACTOR's project manager, site superintendent, and Progress Schedule preparer.
    b. Project manager and site superintendent for each prime contractor other than General CONTRACTOR.
    c. ENGINEER
    d. DEPARTMENT or CITY may attend one or more scheduling workshop conferences.
3. ENGINEER will prepare minutes of the scheduling workshop conferences and distribute minutes to each attendee.

1.4 SUBMITTALS

A. Quantity of each submittal required and timing of submittals are indicated in this Section.

B. Informational Submittals: Submit the following:
    1. Ninety-day Bar Chart:
        a. Preliminary 90-day bar chart.
        b. Acceptable 90-day bar chart.
    2. Initial Progress Schedules:
        a. Preliminary Progress Schedule with associated Network Diagrams, and narrative report.
        b. Acceptable Progress Schedule with associated Network Diagrams, and narrative report.
        c. Preliminary resource-and cost-loaded Progress Schedule and associated reports.
        d. Acceptable resource-and cost-loaded Progress Schedule and associated reports.
        e. Submit each Progress Schedule submittal with letter of transmittal complying with requirements of Section 01 33 00, Submittal Procedures.
    3. Progress Schedule Updates.
        a. Progress Schedule updates shall comply with requirements of this Section, and shall include updated Progress Schedule, narrative report, updated Network Diagram when relationships among Activities are changed.
        b. Submit updated Progress Schedule prior to each progress meeting. When a Progress Schedule remains unchanged from one progress meeting to the next, submit a written statement to that effect. In addition to monthly Progress Schedule submittals, also bring to progress meeting the number of printed copies of the updated Progress Schedule indicated in Section 01 31 19.23, Progress Meetings.
    4. Look-Ahead Schedules
        a. Furnish 30-day look-ahead schedule at each progress meeting.
    5. Time Impact Analyses: Submit in accordance with this Section.
    6. Recovery Schedule: Submit in accordance with this Section.

7. Qualifications:
    a. Submit qualifications of Progress Schedule preparer, and other personnel that will assist Progress Schedule preparer in preparing and maintaining the Progress Schedule.

1.5 INITIAL PROGRESS SCHEDULES

A. Type and Organization of Progress Schedules:
    1. Prepare Progress Schedule using Oracle Primavera P6 software, unless other scheduling software is acceptable to ENGINEER.
    2. Sheet Size: 22 inches x 34 inches, unless otherwise accepted by ENGINEER.
    3. Time Scale: Indicate first date of each work week.
    4. Activity Designations: Indicate title and related Specifications Section number.
    5. Progress Schedules shall be CPM Progress Schedules.
    6. Organization:
        a. Indicate on the separate Schedule of Submittals dates for submitting and reviewing Shop Drawings, Samples, and other submittals.
        b. Group deliveries of materials and equipment into a separate sub-schedule that is part of the Progress Schedule.
        c. Group construction into Work Area sub-schedules (that are part of the Progress Schedule) by Activity.
        d. Clearly indicate the Critical Path on the Progress Schedule.
        e. Organize each Work Area sub-schedule by Specifications Section number.

B. Ninety-day Bar Chart:
    1. For the first 90 days after the Contract Times commence running, the 90-day bar chart accepted by ENGINEER will serve as an initial progress schedule for mobilization and initial Work until the preliminary Progress Schedule is submitted. Ninety-day bar chart shall include the Work under each prime contract for the Project.
    2. General CONTRACTOR shall prepare 90-day bar chart using same scheduling software required for Progress Schedule, with same information required for Progress Schedule, indicated for the first 90 days after the Contract Times commence running.
    3. Submit 90-bar chart in accordance with Section 01 31 26, Electronic Communication Protocols and Section 01 33 00, Submittal Procedures. Also submit 90-day bar chart in its native format generated by the scheduling software, transmitted using the transmission method indicated in Section 01 31 26, Electronic Communication Protocols.
    4. Within five days after the Effective Date of the Contract, obtain from each other prime contractor on the Project schedule requirements for the first 90 days. General CONTRACTOR shall coordinate needs among other prime contractors on the Project and develop the 90-day bar chart.
    5. Within 10 days after the Effective Date of the Contract, submit preliminary 90-day bar chart.

6. Not less than 10 days before submission of General CONTRACTOR's first Application for Payment a conference attended by each separate prime contractor on the Project, Progress Schedule preparer, ENGINEER, and others as appropriate will be held to review for acceptability to ENGINEER as provided below the preliminary 90-day bar chart. Following the conference, General CONTRACTOR shall have 10 days to make corrections and adjustments and to complete and resubmit the acceptable 90-day bar chart. DEPARTMENT reserves the right to not make progress payment to any prime contractor until acceptable 90-day bar chart is submitted to ENGINEER.
7. Ninety-day bar chart will be acceptable to ENGINEER if it provides an orderly progression of the Work in the first 90 days of the Project and indicates compliance with Milestones, if any, in the first 90 days of the Project. Such acceptance will not impose on ENGINEER responsibility for the 90-day bar chart or the Progress Schedule for sequencing, scheduling, or progress of the Work nor interfere with or relieve CONTRACTOR from CONTRACTOR's full responsibility therefor.
8. After 90-day bar chart is accepted by ENGINEER and prior to acceptance of the Progress Schedule by ENGINEER, CONTRACTORS may apply for progress payments for bonds and insurance, mobilization, and approved Shop Drawings and Samples (and acceptance of other submittals, as applicable) required for fabricating or purchasing materials and equipment to be incorporated into the Work.

C. Preliminary Progress Schedule:
1. Within fifteen days after the Contract Times commence running, each prime contractor shall meet with ENGINEER where each shall present to ENGINEER a list showing each item of material or equipment to be procured for the Work; and for each material or equipment item, necessary dates for each step in the procurement process, including those for placement of orders, approval of submittals, receipt of approvals, and delivery. Delivery time problems or other problem anticipated, if any, shall be notes as remarks in the list. Attached to the list shall be a separate statement of other anticipated problems, if any, not associated with material or equipment procurement that may affect progress of CONTRACTOR or another prime contractor on the Project.
2. ENGINEER will transmit to General CONTRACTOR one copy of each of the aforementioned lists and statements. General CONTRACTOR shall thereupon prepare the preliminary Progress Schedule for the entire Project, including work under each prime contract. General CONTRACTOR shall submit to ENGINEER the preliminary Progress Schedule covering the entire Project, with associated Network Diagrams within 10 days after the Contract Times commence running.
3. Submit preliminary Progress Schedule in accordance with Section 01 31 26, Electronic Communication Protocols and Section 01 33 00, Submittal Procedures. Also submit preliminary Progress Schedule in its native format generated by the scheduling software, transmitted using the transmission method indicated in Section 01 31 26, Electronic Communication Protocols.

4. Coordination with Other Prime Contractors:
    a. Concurrent with submittal to ENGINEER, transmit preliminary Progress Schedule and associated reports and schedule-related documents to accompany the preliminary Progress Schedule to each other prime contractor on the Project. Transmit in accordance with Section 01 31 26, Electronic Communication Protocols and Section 01 33 00, Submittal Procedures. Also transmit preliminary Progress Schedule in its native format generated by the scheduling software, transmitted using the transmission method indicated in Section 01 31 26, Electronic Communication Protocols.
    b. Each other prime contractor on the Project shall submit to ENGINEER comments on the preliminary Progress Schedule and related documents within five days of receipt.
    c. If ENGINEER does not receive comments on the preliminary Progress Schedule and related documents from any prime contractor within the number of days specified in this paragraph, ENGINEER will presume that that the particular prime contractor deems the preliminary Progress Schedule and related documents acceptable relative to the work of that prime contractor.
5. ENGINEER will conduct a timely review of the preliminary Progress Schedule.
6. Preliminary Progress Schedule shall comply with the Contract Documents relative to Progress Schedules, but need not be resource-and cost-loaded.

D. Initial Acceptance of Progress Schedule:
1. Not more than 15 days after the Contract Times commence running, a scheduling conference attended by each prime contractor on the Project, Progress Schedule preparer, ENGINEER, and others as appropriate will be held at the Site to review for acceptability to ENGINEER the preliminary Progress Schedule and associated Network Diagram and other reports and schedule-related documents required. Following the scheduling conference, General CONTRACTOR shall have 5 days to make corrections and adjustments and to complete and resubmit the Progress Schedule and associated Network Diagram. Other than bonds and insurance, mobilization, and approved Shop Drawings (and acceptance of other submittals, as applicable) required for fabricating or purchasing materials and equipment to be incorporated into the Work, OWNER reserves the right to not make progress payments to any prime contractor until acceptable Progress Schedule, Network Diagram, and other reports and schedule-related documents required are submitted to ENGINEER.
2. Submit acceptable Progress Schedule, together with Network Diagram, reports, and other schedule-related documents required to accompany the initial acceptable Progress Schedule, in accordance with the Submittals Article of this Section, Section 01 31 26, Electronic Communication Protocols, and Section 01 33 00, Submittal Procedures. Also submit acceptable form of Progress Schedule in its native format generated by the scheduling software, transmitted using the transmission method indicated in Section 01 31 26, Electronic Communication Protocols.

3. The Progress Schedule will be acceptable to ENGINEER if it provides an orderly progression of the Work to completion within the Contract Times, in accordance with the Contract Documents. Such acceptance will not impose on ENGINEER responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work nor interfere with or relieve any prime contractor from CONTRACTOR's full responsibility therefore.
4. Initially-accepted Progress Schedule shall be identified as the baseline Progress Schedule.

E. Resource- and cost-Loaded Progress Schedule:
1. Not more than ten days after ENGINEER's acceptance of the Progress Schedule, each prime contractor shall meet with ENGINEER, and each shall present to ENGINEER a list with detailed information sufficient for General CONTRACTOR to create a resource- and cost-loaded Progress Schedule. Data shall be for each Activity in the Progress Schedule accepted by ENGINEER to which CONTRACTOR will commit resources to accomplish the Work.
2. ENGINEER will transmit to General CONTRACTOR one copy of each of the aforementioned data required for the resource and cost-loaded Progress Schedule. General CONTRACTOR shall thereupon prepare and, within five days of receipt of information from ENGINEER, submit to ENGINEER resource- and cost-loaded Progress Schedule complying with resource and cost loading requirements in this Section.
3. Submit of the preliminary and the acceptable resource- and cost-loaded Progress Schedules and associated reports to accompany the initial submittals of resource and cost-loaded Progress Schedules in accordance with the Submittals Article of this Section, Section 01 31 26, Electronic Communication Protocols, and Section 01 33 00, Submittal Procedures. Also submit preliminary and acceptable form of resource- and cost-loaded Progress Schedules in its native format generated by the scheduling software, transmitted using the transmission method indicated in Section 01 31 26, Electronic Communication Protocols.
4. Resource- and cost-loaded Progress Schedules will be reviewed by ENGINEER within ten days of ENGINEER's receipt, and ENGINEER's comments will be transmitted to General CONTRACTOR.
5. Make revisions required in accordance with ENGINEER's comments and resubmit to ENGINEER within five days of General CONTRACTOR's receipt of ENGINEER's comments.
6. Resource- and cost-loaded Progress Schedule accepted by ENGINEER shall be the basis for determining the amount of each progress payment for each prime contractor on the Project.

F. If the Progress Schedule reflects completion date(s) different than the Contract Times, the Contract Times are not thereby voided, nullified, or affected. The Contract Times govern. Where the Progress Schedule reflects completion date(s) that are earlier than the Contract Times, ENGINEER may accept such Progress Schedule with each prime contractor to specifically understand that no Change Proposals or

Claims for additional Contract Times or additions to the Contract Price shall be brought against OWNER resulting from CONTRACTOR's failure to complete the Work by the earlier date(s) indicated on the accepted Progress Schedule.

1.6 PROGRESS SCHEDULE UPDATES

A. Updates:
   1. Update the Progress Schedule not less-often than once per month. If during progress of the Work events develop that necessitate changes in the initially accepted Progress Schedule (e.g., baseline Progress Schedule), identify updated Progress Schedules sequentially as "Progress Schedule Revision 1", "2", "3", and continuing in sequence as required. Number the Progress Schedule submittals in accordance with Section 01 33 00, Submittal Procedures.
   2. Other prime contractors shall promptly furnish to General CONTRACTOR information necessary for Progress Schedule updates. General CONTRACTOR's Progress Schedule update shall include a narrative report in accordance with this Section. Narrative report shall include description of current progress and status of each Area of the Project, a description of progress for the period, a description of the Critical Path, a discussion of current or potential delays, Change Orders (pending and approved since the previous Progress Schedule update), and other problems associated with maintaining the Work on schedule.
   3. The update to the Progress Schedule shall be based on retained logic. Progress override logic is not allowed.
   4. Required scheduling software, and schedule organization, format, and content for updated Progress Schedules are identical to that required in this Section for initial Progress Schedules.
   5. Submit to ENGINEER updated Progress Schedule, together with Network Diagrams (when required), reports, and other schedule-related documents required to accompany the updated Progress Schedule, in accordance with Section 01 31 26, Electronic Communication Protocols, and Section 01 33 00, Submittal Procedures. Also submit updated Progress Schedule in its native format generated by the scheduling software, transmitted using the transmission method indicated in Section 01 31 26, Electronic Communication Protocols.
   6. Submit updated Network Diagrams when revisions are proposed to the logic. Indicate in the narrative report delays that have occurred since the previous updated Progress Schedule. ENGINEER will not recommend payment by DEPARTMENT of progress payments until updated Progress Schedule is received, reviewed, and accepted by ENGINEER. Payment for out-of-sequence Work is not allowed.

B. Monthly Schedule Meeting:
   1. During the month, utilizing the most-recent, previous 30-day look-ahead schedule, each prime contractor shall record the percent complete, start and finish dates of each scheduled Activity for which that prime contractor will allocate resources with the remaining duration for each Activity started but not

completed, including Activities associated with procurement of materials and equipment and shall transmit this information to General CONTRACTOR with copy to ENGINEER using the transmission method indicated in Section 01 31 26, Electronic Communication Protocols.

2. On the same day each month, not less than one week prior to a progress meeting, each prime contractor on the Project, Progress Schedule preparer, ENGINEER, and others as appropriate shall meet at the Site and tour the Work to review and update the schedule and progress information gathered by General CONTRACTOR during the month. After acceptance of each prime contractor's updated data, Progress Schedule preparer shall use this information to update the Progress Schedule.

1.7 NETWORK DIAGRAMS (PERT CHARTS)

A. Network Diagrams – General:
   1. General CONTRACTOR shall prepare and submit Network Diagrams, as generated using the scheduling software suitable for printing on paper of the size indicated for Progress Schedules in this Section.
   2. Group Network Diagrams by Area and show the order and interdependence of Activities and sequence and quantities in which the Work will be accomplished.
   3. Do not use match lines on Network Diagrams. Depict interrelationships to or from Activities outside the Area shown using an Activity symbol with Activity number and description.
   4. In preparing Network Diagrams, comply with the basic concept of precedence diagramming method (PDM) network scheduling to show how start of a given Activity depends on completion of preceding Activities, and how the Activity's completion may affect the start of subsequent Activities.
   5. Level of schedule detail shall define the day-to-day Activities of the Work.

B. Network Diagram Content:
   1. Clearly indicate the Critical Path and distinguish the Critical Path from other paths on the network.
   2. Organize Network Diagrams by grouping into major Work Areas, including one for procurement of materials and equipment, and by specific Activity within each Area.
   3. Logic diagrams shall include the following:
      a. Activity number.
      b. Activity description.
      c. Activity duration (in work days).
      d. Critical Path denoted.
      e. Float for each Activity.
      f. Activity or System designation.
      g. Coded Area designation.
      h. Responsibility code (e.g., each prime contractor and their respective Subcontractors, trade, operation, Suppliers, or other entity responsible for

accomplishing an Activity).

i. Shift number (if more than one shift per day is to be employed).

C. Network Diagram Revisions:

1. General:

a. When conditions develop that require revisions to logic or durations of the Network Diagram associated with the initially accepted Progress Schedule (e.g., baseline Progress Schedule), identify updates to the Network Diagram in the same manner required in this Section for Progress Schedule updates.

b. Revision of the logic or durations from the baseline Progress Schedule initially accepted by ENGINEER shall be submitted to ENGINEER for acceptance.

c. Incorporate into the Progress Schedule revisions to logic or duration accepted by ENGINEER, and include in monthly narrative report both a description of revisions and listing of Activities affected by revisions.

d. Changes resulting from Change Orders, Work Change Directives, Field Orders, allowance authorizations, and other additions or deletions, shall be fully incorporated into the Progress Schedule and Network Diagram on the first update after the associated Change Orders, Work Change Directive, or allowance authorization is approved by DEPARTMENT, or Field Order issued by ENGINEER, including adjustments to the Contract Price (if any).

2. Submit revised Network Diagrams with updated Progress Schedule submittals.

1.8 RESOURCE AND COST LOADING REPORTS

A. Resource Loading:

1. After ENGINEER's initial acceptance of the Progress Schedule, each prime contractor shall assign resources for personnel labor-hours, materials, and equipment to each construction Activity within each responsibility code. Each prime contractor shall submit resource-loading data to General CONTRACTOR with copy to ENGINEER using the transmission method indicated in Section 01 31 26, Electronic Communication Protocols.

2. General CONTRACTOR shall submit resource schedule reports with each updated Progress Schedule.

B. Cost Loading:

1. Using cost data furnished by each other prime contractor, General CONTRACTOR shall assign each Activity a total dollar amount commensurate with its value relative to the associated line item in the Schedule of Values accepted by ENGINEER for each prime contract. General CONTRACTOR shall submit cost reports for the initially accepted cost-loaded Progress Schedule and each subsequent update of the Progress Schedule.

2. After the cost-loaded Progress Schedule is accepted by ENGINEER, each Application for Payment for each prime contract on the Project will be on the basis of earned revenue as indicated in updates of the Progress Schedule.

1.9 NARRATIVE REPORT

A. General Provisions for Narrative Reports:
   1. Prepare and include with the preliminary Progress Schedule and each subsequent Progress Schedule submittal, written narrative report describing the schedule-related requirements of the Contract Documents and each prime contractor's plan and schedule for complying with such requirements.
   2. Narrative report shall describe the methods of sequencing and operation, resources to be employed, time frames for the construction of each of the major Systems on the Project, and time frames for complying with the Contract Times and each prime contractor's interim schedule milestones.
   3. Prime contractors other than General CONTRACTOR shall promptly furnish to General CONTRACTOR, with copy to ENGINEER, using the transmission method indicated in Section 01 31 26, Electronic Communication Protocols, information requested by General CONTRACTOR to complete each narrative report.

1.10 TIME IMPACT ANALYSIS

A. Time Impact Analyses – General:
   1. Prepare and submit a time impact analysis when one or more of the following occurs for one or more of the prime contracts on the Project: a Change Proposal is prepared, a Work Change Directive is issued that will affect the Progress Schedule, or when delays are experienced. Time impact analysis shall illustrate the influence of each Change Order, Work Change Directive, allowance authorization, or delay, as applicable, on the Contract Times and schedule milestones.
   2. Each time impact analysis shall include a sketch (fragnet) demonstrating how General CONTRACTOR and other affected prime contractors, if any, proposes to incorporate the changes in the Project or, as applicable, delays into the Progress Schedule. Fragnet shall include all logic, resource and cost changes, and additions required as result of said Change Order, Work Change Directive, allowance authorization, or delay.
   3. Fragnet shall show all CPM logic revisions for the Work associated with the Change Order, Work Change Directive, allowance authorization, or delay and its relationship to other Activities in the Network Diagram.
   4. Time impact analysis shall demonstrate the time impact, based on date the Change Order, Work Change Directive, or allowance authorization was given to CONTRACTOR, or as applicable the date the delay was implemented; the status of the Project at that point in time; and the Activity duration of affected Activities. Activity duration used in the time impact analysis shall be those included in the latest update of the Progress Schedule accepted by ENGINEER,

closest to the time of the start of the delay or start of the Change Order, Work Change Directive, or allowance authorization as adjusted by mutual, written agreement of the parties and ENGINEER.

5. Timing of Time Impact Analysis:
   a. Submit each time impact analysis within five days after the following, as applicable:
      1) Start of the delay.
      2) After the submittal of Change Proposal to ENGINEER. For prime contracts other than General Contract, the number of days indicated shall be after General CONTRACTOR's receipt of information required to prepare time impact analysis. Other prime contractors shall submit information required for time impact analysis in a timely manner.
      3) After CONTRACTOR's Receipt of Work Change Directive. For prime contractors other than General CONTRACTOR, the number of days indicated shall be after General CONTRACTOR's receipt of information required to prepare time impact analysis. Other prime contractors shall submit information required for time impact analysis in a timely manner.
   b. General CONTRACTOR shall submit time impact analysis to affect other prime contractors concurrent with transmittal of time impact analysis submittal to ENGINEER.
   c. Failure to Submit Time Impact Analysis:
      1) When General CONTRACTOR does not submit time impact analysis for a specific change or delay under the General Contract, within the specified period of time for such submittal, such non-submittal shall be construed that no extension of the Contract Times is required
      2) When prime contractor other than General CONTRACTOR does not submit information for General CONTRACTOR to prepare time impact analysis for a specific change or delay under the associated prime contract, within the specified period of time for such submittal, such non-submittal shall be construed that no extension of the Contract Times is required for that prime contract.
      3) If General CONTRACTOR fails to submit time impact analysis for a Change Proposal or Work Change Directive under another prime contract on the Project, said other prime contractor may be eligible for extension of the Contract Times despite General CONTRACTOR's failure to submit time impact analysis.

B. Evaluation by Engineer and Acceptance:
   1. ENGINEER's evaluation of each time impact analysis comprised of complete information will be completed in timely manner after ENGINEER's receipt. Changes in the Contract Times will be made only by Change Order.

2. When mutual agreement is reached between the parties, including other affected prime contractors (if any), on effect of the change or delay in the Project, incorporate into the next Progress Schedule update the associated fragnets illustrating the influence of changes and delays.

1.11 RECOVERY SCHEDULES

A. General Provisions for Recovery Schedules:
   1. When updated Progress Schedule indicates that the ability to comply with the Contract Times falls five or more days behind schedule, and there is no excusable delay, Change Order, or Work Change Directive to support an extension of the Contract Times, General CONTRACTOR shall prepare and submit a Progress Schedule demonstrating General CONTRACTOR's plan to accelerate the Project to achieve compliance with the Contract Times ("recovery schedule") for ENGINEER's acceptance.
   2. When recovery schedule will affect another prime contractor on the Project, obtain input on proposed recovery schedule action from other prime contractors affected. Incorporate requirements of other prime contractors into the recovery schedule to the extent practicable.
   3. Submit recovery schedule within five days after submittal of updated Progress Schedule where need for recovery schedule is indicated.

B. Implementation of Recovery Schedule:
   1. At no additional cost to DEPARTMENT, do one or more of the following: furnish additional labor, provide additional construction equipment, provide suitable materials, employ additional work shifts, expedite procurement of materials and equipment to be incorporated into the Work, and other measures necessary to complete the Work within the Contract Times.
   2. When prime contractor is required to accelerate their Work and incurs additional cost for such acceleration for reasons not due to the actions of that prime contractor, submit Change Proposal to ENGINEER.
   3. Upon acceptance of recovery schedule by ENGINEER, incorporate recovery schedule into the next Progress Schedule update.

C. Lack of Action:
   1. Prime contractor's refusal, failure, or neglect to take appropriate recovery action, or General CONTRACTOR's refusal to submit a recovery schedule, shall constitute reasonable evidence that CONTRACTOR is not prosecuting the Work or separable part thereof with the diligence that will ensure completion within the Contract Times. Such lack of action shall constitute sufficient basis for OWNER to exercise remedies available to OWNER under the Contract Documents.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

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SECTION 01 32 33

PHOTOGRAPHIC DOCUMENTATION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. General CONTRACTOR shall retain a photographer to perform services specified, including:
      a. Digital photography.
      b. Digital videography.
   2. Furnish photographic documentation for the following:
      a. Pre-construction.
      b. Construction progress.
      c. Final.

B. Image Quality:
   1. Photographic documentation shall be in color.
   2. Photographic images shall be suitably staged and set up ("framed"), focused, and shall have adequate lighting to illuminate the Work and conditions that are the subject of the photograph.
   3. For still photographs, use camera with minimum 16.0-megapixel resolution.

1.2 QUALITY ASSURANCE

A. Qualifications:
   1. Photographer:
      a. CONTRACTOR designated personnel experienced in photographing construction sites.

B. At the Site, ENGINEER or Resident Project Representative will indicate the views to be taken and will select time at which images will be taken. Photographic subjects, views, and angles will vary with progress of the Work.

1.3 SUBMITTALS

A. Informational Submittals: Submit the following:
   1. Pre-construction Photographic Documentation: Submit acceptable pre-construction photographic documentation (prints and digital files) prior to mobilizing to and disturbing the Site. Submit pre-construction photographic documentation not later than the first Application for Payment, unless other schedule for pre-construction photographic documentation is accepted by ENGINEER.

2. Construction Progress Photographic Documentation: Submit acceptable construction progress photographic documentation (prints and digital files) not less-often than monthly. Submit with each Application for Payment, unless otherwise agreed to by ENGINEER.
3. Qualifications Statements:
   a. When requested by ENGINEER, prior to starting photographic documentation, submit photographer qualifications and record of experience. List of construction photography experience shall include the following for each project:
      1) Project name and location
      2) Nature of construction.
      3) Photographer's client with contract information.
      4) Approximate duration of photographer's services.

B. Closeout Submittals: Submit the following:
   1. Final Photographic Documentation: Submit acceptable final photographic documentation (prints and digital files) prior to requesting the final inspection by ENGINEER.

1.4 PHOTOGRAPHIC DOCUMENTATION – GENERAL

A. Digital Files of Photographs:
   1. For each photograph taken, furnish high-quality digital image in "JPG" file format compatible with Microsoft Windows 7 and higher operating systems.
   2. Image resolution shall be sufficient for clear, high-resolution prints. Minimum resolution shall be 150 dots per inch (dpi). Minimum size of digital images shall be 8x10.
   3. Do not imprint date and time in the image.
   4. Electronic image filename shall describe the image; do not submit filenames automatically created by digital camera. For example, an acceptable electronic filename would be, "Dewatering Building – Looking West at Centrifuge No. 2.jpg".
   5. Form of Digital Submittal – Images on Discs:
      a. Submit digital files on compact discs (CD) or digital video discs (DVD).
      b. Submit three copies of each disc with digital files of photographic images.
      c. Include the following information on front of each disc containing photographic documentation:
         1) Date(s) photographs were taken.
         2) Name of OWNER.
         3) Name of the Site.
         4) Project name.
         5) Photographer name and address.

5. Form of Digital Submittal – Image File Upload:
    a. Upload digital files of Project photographic documentation to the Project website, as indicated in Section 01 31 26, Electronic Communication Protocols.
    b. Upload files to new directory each time files are uploaded. Directory name shall be the date the photographs were taken (in the form of YEAR-MO-DAY), with brief general description of subject matter. Example: "2013-09-10 – Concrete Reinforcing in Slab".

C. Videography:
1. Video shall be high-definition (HD), high-quality video of the Site and Project work.
2. All video files for the entire Project shall be submitted in one container file format. Video files shall be in one of the following container file formats:
    a. AVI (Microsoft systems).
    b. Flash Video (F4V, FLV; Adobe systems).
    c. QuickTime File Format (MOV, QT; Apple, Inc.).
    d. MP4 ("MPEG-4 Part 14").
3. Video image shall have imprinted date and time that video was taken.
4. Include audio narration sufficient to explain the scenes shown.
5. Form of Digital Submittal – Video Discs:
    a. Submit digital files on digital video discs (DVD) in standard DVD-R or DVD+R discs.
    b. Submit three copies of each disc with digital files of video.
    c. Include the following information on front of each disc containing video documentation:
        1) Date(s) video was taken.
        2) Name of OWNER.
        3) Name of the Site.
        4) Project name.
        5) Videographer name and address.

1.5 PRE-CONSTRUCTION PHOTOGRAPHIC DOCUMENTATION

A. Pre-construction Photographic Documentation:
1. Obtain and submit sufficient pre-construction photographic documentation to record Site conditions prior to construction. Photographs shall document work areas of all prime contracts under the Project.
2. Pre-construction photographs are not part of required number of construction progress photographs specified in Article 1.6 of this Section.
3. Furnish pre-construction video of all work areas included in all prime contracts on the Project, including indoor and outdoor work areas and staging areas.
4. Obtain and submit current, pre-construction aerial photographs of the Site, obtained within one month of the Effective Date of the Contract. Submit one oblique photograph taken from each cardinal direction (north, south, east, and west). Obtain permits or permission, as applicable, for required flyovers.

B. If disagreement arises on the condition of the Site and insufficient pre-construction photographic documentation was submitted prior to the disagreement, restore the grounds or area in question to extent directed by ENGINEER and to satisfaction of ENGINEER.

1.6 CONSTRUCTION PROGRESS PHOTOGRAPHIC DOCUMENTATION

A. Progress Photographs:
   1. Take photographs not less often than twice per month.
   2. Take not less than 20 photographs each time photographer is at the Site.
   3. Maximum number of progress photographs required will be 600, based on the Contract Times to Substantial Completion of the entire Project and scope of the Project on date the Contract Times commence running. Proportionately modify the extent of photographic documentation if scope of the Project or the Contract Times are modified.
   4. Obtain and submit interior and exterior photographic documentation of each structure in the work area as directed by ENGINEER at the time photographic documentation is taken.

1.7 FINAL PHOTOGRAPHIC DOCUMENTATION

A. Final Photographs:
   1. Take photographs at time and day acceptable to ENGINEER. Do not take final photographs prior to Substantial Completion of the entire Project. Work documented in final photographs shall be generally complete, including painting and finishing, furnishings, landscaping, and other visible Work
   2. Take not less than 40 final photographs, based on scope of the Project at the time that the Contract Times commence running. Proportionately modify the number of final photographs if scope of Project is modified. Final photographs are not part of construction progress photographs required under Paragraph 1.6.A of this Section.

B. Video:
   1. Record final video at same time that final photographs are taken.
   2. Final videography shall cover all areas of the Project.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall prepare and furnish submittals in accordance with the Agreement and this Section.
   2. Provide submittals well in advance of need for the material or equipment, or procedure (as applicable), in the Work and with ample time required for delivery of materials and equipment and to implement procedures following ENGINEER's approval or acceptance of the associated submittal. Work covered by a submittal will not be included in progress payments until approval or acceptance of related submittals has been obtained in accordance with the Contract Documents.
   3. CONTRACTOR is responsible for dimensions to be confirmed and corrected at the Site; quantities; information pertaining solely to fabrication processes; means, methods, sequences, procedures, and techniques of construction; safety precautions and programs incident thereto; and for coordinating the work of all trades.
   4. CONTRACTOR's signature of submittal's stamp and letter of transmittal shall be CONTRACTOR's representation that CONTRACTOR has complied with his obligations under the Contract Documents relative to that submittal. ENGINEER and DEPARTMENT shall be entitled to rely on such representations by CONTRACTOR.
   5. Provisions of the Agreement apply to all CONTRACTOR-furnished submittals required by the Contract Documents, regardless of whether such submittals are other than Shop Drawings or Samples.

B. Samples:
   1. Submittal of Samples shall comply with the Agreement, this Section, and the Specifications Section in which the Sample is specified.
   2. Furnish at the same time those Samples and submittals that are related to the same element of the Work or Specifications Section. ENGINEER will not review submittals without associated Samples, and will not review Samples without associated submittals.
   3. Samples shall clearly illustrate functional characteristics of materials, all related parts and attachments, and full range of color, texture, pattern, and materials.

C. Restrictions on Quantity of Submittals and Compensation of DEPARTMENT:
   1. CONTRACTOR shall furnish required submittals with sufficient information and accuracy to obtain required approval or acceptance of submittal by ENGINEER with not more than the number of resubmittals indicated in the General Conditions (as may be modified by the Supplementary Conditions).
   2. Total number of CONTRACTOR's submittals shall not exceed 25 percent above the total number of first-time submittals indicated in the Schedule of Submittals initially accepted by ENGINEER in accordance with the General Conditions. ENGINEER will record ENGINEER's time for reviewing submittals of Shop Drawings, Samples, and other submittals and items requiring approval or acceptance, beyond the quantity of first-time submittals indicated in the Schedule of Submittals initially accepted by ENGINEER, and CONTRACTOR shall reimburse DEPARTMENT for ENGINEER's charges for such time.
   3. In the event that CONTRACTOR requests a substitution for a previously approved item, Contractor shall reimburse DEPARTMENT for ENGINEER's charges for such time unless the need for such substitution is beyond the control of CONTRACTOR.
   4. DEPARTMENT may impose set-offs against CONTRACTOR for the costs for which CONTRACTOR is to reimburse or compensate DEPARTMENT, in accordance with the General Conditions.

1.2 TYPES OF SUBMITTALS

A. Submittal types are classified as follows: 1) Action Submittals, 2) Informational Submittals, 3) Closeout Submittals, and 4) Maintenance Material submittals. Type of each required submittal is designated in the respective Specifications Sections; when type of submittal is not designated in the associated Specification Section, submittal will be classified as follows:
   1. Action Submittals include:
      a. Shop Drawings.
      b. Product data.
      c. Delegated design submittals, which include documents prepared, sealed, and signed by a design professional retained by CONTRACTOR, Subcontractor, or Supplier for materials and equipment to be incorporated into the completed Work. Delegated design submittals do not include submittals related to temporary construction unless specified otherwise in the related Specifications Section. Delegated design submittals include: design drawings, design data including calculations, specifications, certifications, and other submittals prepared by such design professional.
      d. Samples.
      e. Testing plans, procedures, and testing limitations.

2. Informational Submittals include:
    a. Certificates.
    b. Design data not sealed and signed by a design professional retained by CONTRACTOR, Subcontractor, or Supplier.
    c. Pre-construction test and evaluation reports, such as reports on pilot testing, subsurface investigations, testing for a potential Hazardous Environmental Condition, and similar reports.
    d. Supplier instructions, including installation data, and instructions for handling, starting-up, and troubleshooting.
    e. Source quality control submittals (other than testing plans, procedures, and testing limitations), including results of shop testing.
    f. Field or Site quality control submittals (other than testing plans, procedures, and testing limitations), including results of operating and acceptability tests at the Site.
    g. Supplier reports.
    h. Sustainable design submittals (other than sustainable design closeout documentation).
    i. Special procedure submittals, including plans for shutdowns and tie-ins and other procedural submittals.
    j. Qualifications statements.
    k. Administrative submittals including:
        1) Progress Schedules.
        2) Schedules of Submittals.
        3) Schedules of Values.
        4) Photographic documentation.
        5) Coordination drawings, when submittal of such is required.
        6) Copies of permits obtained by CONTRACTOR.
        7) Field engineering reports, survey data, and similar information.
3. Closeout Submittals include:
    a. Maintenance contracts.
    b. Operations and maintenance data.
    c. Bonds, such as special maintenance bonds and bonds for a specific material, equipment item, or system.
    d. Warranty documentation.
    e. Record documentation.
    f. Sustainable design closeout documentation.
    g. Software.
    h. Keying.
4. Maintenance Material Submittals include:
    a. Spare parts.
    b. Extra stock materials.
    c. Tools.
5. When type of submittal is not specified and is not included in the list above, request an interpretation from ENGINEER and ENGINEER will determine the type of submittal.

B. Not Included in this Section: Administrative and procedural requirements for following are covered elsewhere in the Contract Documents:
   1. Requests for interpretations of the Contract Documents.
   2. Change Orders, Work Change Directives, and Field Orders.
   3. Applications for Payment
   4. Reports, documentation, and permit applications required to be furnished by CONTRACTOR to authorities having jurisdiction.

1.3 REQUIREMENTS FOR SCHEDULE OF SUBMITTALS

A. Informational Submittals: Submit the following:
   1. Schedule of Submittals:
      a. Timing:
         1) Furnish submittal within time frames indicated in the Contract Documents.
         2) Submit updated Schedule of Submittals with each submittal of the updated Progress Schedule.
      b. Content: In accordance with the General Conditions, as may be modified by the Supplementary Conditions, and this Section. Requirements for content of preliminary Schedule of Submittals and subsequent submittals of the Schedule of Submittals are identical. Identify on Schedule of Submittals all submittals required in the Contract Documents. Updates of Schedule of Submittals shall show scheduled dates and actual dates for completed tasks. Indicate submittals that are on the Project's critical path. Indicate the following for each submittal:
         1) Date by which submittal will be received by ENGINEER.
         2) Whether submittal will be for a substitution or "or-equal". Procedures for requesting approval of substitutes and "or-equals" are specified in the General Conditions, Section 01 25 00, Substitution Procedures, and Section 01 62 00, Product Options (for "or-equals").
         3) Date by which ENGINEER's response is required. Not less than ten days shall be allowed for ENGINEER's review, starting upon ENGINEER's actual receipt of each submittal. Allow increased time for large or complex submittals.
         4) For submittals for materials or equipment, date by which material or equipment must be at the Site to avoid delaying the Work and to avoid delaying the work of other contractors, if any.
      c. Prepare Schedule of Submittals using same software, and in same format, specified for Progress Schedules in Section 01 32 16, Progress Schedule.
      d. Coordinate Schedule of Submittals with the Progress Schedule.
      e. Schedule of Submittals that is not compatible with the Progress Schedule, or that does not indicate submittals on the Project's critical path, or that that places extraordinary demands on ENGINEER for time and resources, is unacceptable. Do not include submittals not required by the Contract Documents.

f. In preparing Schedule of Submittals:
   1) Considering the nature and complexity of each submittal, allow sufficient time for review and revision.
   2) Reasonable time shall be allowed for: ENGINEER's review and processing of submittals, for submittals to be revised and resubmitted, and for returning submittals to CONTRACTOR.
   3) Identify and accordingly schedule submittals that are expected to have long anticipated review times.

1.4 PROCEDURE FOR SUBMITTALS

A. Submittal Identification System: Use the following submittal identification system, consisting of submittal number and review cycle number.
   1. Submittal Number: Shall be separate and unique number correlating to each individual submittal required. Assign submittal numbers as follows:
      a. First part of submittal number shall be the applicable Specifications Section number, followed by a hyphen.
      b. Second part of submittal number shall be a three-digit number (sequentially numbered from 001 through 999) assigned to each separate and unique submittal furnished under the associated Specifications Section.
      c. Typical submittal number for the third submittal furnished for Section 40 05 19, Ductile Iron Process Pipe, would be "40 05 19-003".
   2. Review Cycle Number: Shall be a letter designation indicating the initial submittal or re-submittal associated with each submittal number:
      a. "A" = Initial (first) submittal.
      b. "B" = Second submittal (e.g., first re-submittal).
      c. "C" = Third submittal (e.g., second re-submittal).
   3. Examples:

Example Description	Submittal Identification	
	Submittal No.	Review Cycle
Initial (first) review cycle of the third submittal provided under Section 40 05 19, Ductile Iron Process Pipe	40 05 19-003-	A
Second review cycle (first re-submittal) of third submittal provided under Section 40 05 19, Ductile Iron Process Pipe	40 05 19-003-	B

B. Letter of Transmittal for Submittals:
   1. Furnish separate letter of transmittal with each submittal. Each submittal shall be for one Specifications Section.
   2. At beginning of each letter of transmittal, include a reference heading indicating: CONTRACTOR's name, DEPARTMNT, Project name, Contract designation, transmittal number, and submittal number.

3. For submittals with proposed deviations from requirements of the Contract Documents, letter of transmittal shall specifically describe each proposed variation.

C. Contractor's Review and Stamp:
   1. Contractor's Review: Before transmitting submittals to ENGINEER, review submittals to:
      a. ensure proper coordination of the Work;
      b. determine that each submittal is in accordance with CONTRACTOR's desires;
      c. verify that submittal contains sufficient information for ENGINEER to determine compliance with the Contract Documents.
   2. Incomplete or inadequate submittals will be returned without review.
   3. Contractor's Stamp and Signature:
      a. Each submittal furnished shall bear CONTRACTOR's stamp of approval and signature, as evidence that submittal has been reviewed by CONTRACTOR and verified as complete and in accordance with the Contract Documents.
      b. Submittals without CONTRACTOR's stamp and signature will be returned without review. Signatures that appear to be computer-generated will be regarded as unsigned and the associated submittal will be returned without review.
      c. CONTRACTOR's stamp shall contain the following:

"Project Name: _____

Contractor's Name: _____

Contract Designation: _____

Date: _____

---------- *Reference* ----------

Submittal Title: _____

Specifications:

Section: _____

Page No.: _____

Paragraph No.: _____

Drawing No.: _____ of _____

Location of Work: _____

Submittal No. and Review Cycle: _____

Coordinated by Contractor with Submittal Nos.: _____

_____

I hereby certify that the Contractor has satisfied Contractor's obligations under the Contract Documents relative to Contractor's review and approval of this submittal.

Approved for Contractor by: _____"

D. Submittal Marking and Organization:
   1. Mark on each page of submittal and each individual component submitted with submittal number and applicable Specifications paragraph.
   2. Arrange submittal information in same order as requirements are written in the associated Specifications Section.
   3. Each Shop Drawing sheet shall have title block with complete identifying information satisfactory to ENGINEER.
   4. Package together submittals for the same Specifications Section. Do not furnish required information piecemeal.

E. Format of Submittal and Recipients:
   1. Action Submittals and Informational Submittals: Furnish in accordance with Table 01 33 00-A, except that submittals of Samples shall be as specified elsewhere in this Section:

TABLE 01 33 00-A: SUBMITTAL CONTACTS AND REQUIRED FORMAT

	Address for Deliveries	Contact Person	E-mail Address	Format*	No. of Printed Copies
a.	Engineer: Arcadis CE, Inc., 855 Route 146, Suite 210 Clifton Park, NY 12065	TBD	TBD@arcadis.com	E	Zero
b.	Resident Project Representative: At the Site.	TBD	TBD@arcadis.com	E	One
* **Format**: E = Electronic files; P = Printed copies. TBD = To Be Determined					

   2. Samples:
      a. Securely label or tag Samples with submittal identification number. Label or tag shall include clear space at least four inches by four inches in size for affixing ENGINEER's review stamp. Label or tag shall not cover, conceal, or alter appearance or features of Sample. Label or tag shall not be separated from the Sample.
      b. Submit quantity of Samples required in Specifications. If quantity of Samples is not indicated in the associated Specifications Section, furnish not less than three identical Samples of each item required for ENGINEER's approval. Samples will not be returned to CONTRACTOR. If CONTRACTOR requires Sample(s) for CONTRACTOR's use, so advise ENGINEER in writing and furnish additional Sample(s). CONTRACTOR is responsible for furnishing, shipping, and transporting additional Samples.

c Deliver one Sample to ENGINEER's field office at the Site. Deliver balance of Samples to ENGINEER at address indicated in Table 01 33 00-A, unless otherwise directed by ENGINEER.

3. Closeout Submittals:
   a. Furnish the following Closeout Submittals in accordance with Table 01 33 00-A: maintenance contracts; bonds for specific materials, equipment, or systems; warranty documentation; and sustainable design closeout documentation. On documents such as maintenance contracts and bonds, include on each document furnished original ("wet") signature of entity issuing said document. When original "wet" signatures are required, furnish such submittals in printed form and electronic form to ENGINEER, and to other entities furnish as indicated in Table 01 33 00-A.
   b. Operations and Maintenance Data: Submit in accordance with Section 01 78 23, Operation and Maintenance Data.
   c. Record Documentation: Submit in accordance with Section 01 78 39, Project Record Documentation.
   d. Software: Submit number of copies required in Specifications Section where the software is specified. If number of copies is not specified, provide two copies on compact disc in addition to software loaded on CITY's computer(s) or microprocessor(s).
4. Maintenance Material Submittals: For spare parts, extra stock materials, and tools, furnish quantity of items specified in associated Specifications Section. Furnish in accordance with Section 01 78 43, Spare Parts and Extra Materials.

F. Electronic Submittals:
   1. Format: Electronic files shall be in "portable document format" (.PDF). Files shall be electronically searchable.
   2. Organization and Content:
      a. Each electronic submittal shall be one file; do not divide individual submittals into multiple files each.
      b. When submittal is large or contains multiple parts, furnish PDF file with bookmark for each section of submittal.
      c. Content shall be identical to printed submittal. First page of electronic submittal shall be CONTRACTOR's letter of transmittal.
   3. Quality and Legibility: Electronic submittal files shall be made from the original and shall be clear and legible. Do not submit scans of faxed copies. Electronic file shall be full size of original, printed documents. Properly orient all pages for reading on a computer screen.
   4. Provide sufficient Internet service and e-mail capability for CONTRACTOR's use in transferring electronic submittals, receiving responses to electronic submittals, and associated electronic correspondence. Check not less than once per day for distribution of electronic submittals, electronic responses to submittal, and electronic correspondence related to submittals.

5. Submitting Electronic Files:
    a. Transmit electronic files in accordance with Section 01 31 26, Electronic Communication Protocols.

G. Distribution:
1. Distribution of ENGINEER's Response via Electronic Files: Upon completion of ENGINEER's review, electronic submittal response will be distributed by ENGINEER to
    a. CONTRACTOR.
    b. DEPARTMENT.
    c. Resident Project Representative (RPR).
    d. ENGINEER's file.

H. Resubmittals: Refer to the General Conditions for requirements regarding resubmitting required submittals.

1.5 ENGINEER'S REVIEW

A. Timing: ENGINEER's review will conform with timing indicated in the Schedule of Submittals accepted by ENGINEER.

B. Submittals not required by the Contract Documents will not be reviewed by ENGINEER and will not be recorded in ENGINEER's submittal log. All printed copies of such submittals will be returned to CONTRACTOR. Electronic copies of such submittals, if any, will not be retained by ENGINEER.

C. Action Submittals, Results of ENGINEER's Review: Each submittal will be given one of the following dispositions by ENGINEER:
1. Approved: Upon return of submittal marked "Approved", order, ship, or fabricate materials and equipment included in the submittal (pending ENGINEER's approval or acceptance, as applicable, of source quality control submittals) or otherwise proceed with the Work in accordance with the submittal and the Contract Documents.
2. Approved as Corrected: Upon return of submittal marked "Approved as Corrected", order, ship, or fabricate materials and equipment included in the submittal (pending ENGINEER's approval or acceptance, as applicable, of source quality control submittals) or otherwise proceed with the Work in accordance with the submittal and the Contract Documents, and in accordance with the corrections indicated in the ENGINEER's submittal response.
3. Approved as Corrected – Resubmit: Upon return of submittal marked "Approved as Corrected – Resubmit", order, ship, or fabricate materials and equipment included in the submittal (pending ENGINEER's approval or acceptance, as applicable, of source quality control submittals) or otherwise proceed with the Work in accordance with the submittal and the Contract Documents, and in accordance with corrections indicated in ENGINEER's submittal response. Furnish to ENGINEER record re-submittal with all

corrections made. Receipt of corrected re-submittal is required before materials or equipment covered in the submittal will be eligible for payment.

4. Revise and Resubmit: Upon return of submittal marked "Revise and Resubmit", make the corrections indicated and re-submit to ENGINEER for approval.
5. Not Approved: This disposition indicates material or equipment that cannot be approved. "Not Approved" disposition may also be applied to submittals that are incomplete. Upon return of submittal marked "Not Approved", repeat initial submittal procedure utilizing approvable material or equipment, with a complete submittal clearly indicating all information required.

D. Informational Submittals, Results of ENGINEER's Review:
1. Each submittal will be given one of the following dispositions:
   a. Accepted: Information included in submittal complies with the applicable requirements of the Contract Documents, and is acceptable. No further action by CONTRACTOR is required relative to this submittal, and the Work covered by the submittal may proceed, and materials and equipment with submittals with this disposition may be shipped or operated, as applicable.
   b. Not Accepted: Submittal does not indicate compliance with applicable requirements of the Contract Documents and is not acceptable. Revise submittal and re-submit to indicate acceptability and compliance with the Contract Documents.
2. The following types of Informational Submittals, when acceptable to ENGINEER, will not receive a written response from ENGINEER. Disposition as "accepted" will be recorded in ENGINEER's submittal log. When submittals of the following are not acceptable, ENGINEER will provide written response to CONTRACTOR
   a. Material safety data sheets (MSDS).
   b. Compaction testing reports.
   c. Concrete testing reports.
   d. Manufacturer's instructions.

E. Closeout Submittals, Results of ENGINEER's Review: Dispositions and meanings are the same as specified for Informational Submittals. When acceptable, Closeout Submittals will not receive a written response from ENGINEER. Disposition as "accepted" will be recorded in ENGINEER's submittal log. When Closeout Submittal is not acceptable, ENGINEER will provide written response to CONTRACTOR.

F. Maintenance Material Submittals, Results of ENGINEER's Review: Dispositions and meanings are the same as specified for Informational Submittals. When acceptable, Maintenance Material Submittals will not receive a written response from ENGINEER. Disposition as "accepted" will be recorded in ENGINEER's submittal log. When Maintenance Material Submittal is not acceptable, ENGINEER will provide written response to CONTRACTOR, and CONTRACTOR is responsible for

costs associated with transporting and handling of maintenance materials until compliance with the Contract Documents is achieved.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

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SECTION 01 35 23

SAFETY REQUIREMENTS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section augments the requirements elsewhere in the Contract Documents regarding CONTRACTOR's responsibilities for safety and protection and includes requirements for CONTRACTOR's safety representative and other safety requirements applicable to the Project.
   2. CONTRACTOR shall provide labor, materials, tools, equipment, training, certifications, protective measures, and incidentals shown, specified, and required to comply with CONTRACTOR's obligations under the Contract for safety and protection of personnel and property.

B. Related Sections: Provisions of this Section are coordinated with, but are not limited to, the following:
   1. Section 01 35 44, Spill Prevention Control and Countermeasures Plan.
   2. Section 01 41 28, Confined Space Entry Permit.
   3. Section 01 51 05, Temporary Facilities.
   4. Section 01 71 33, Protection of the Work and Property.

1.2 QUALITY ASSURANCE

A. Qualifications:
   1. CONTRACTOR's Safety Representative:
      a. ENGINEER's acceptance of CONTRACTOR's safety representative's qualifications does not in any way mitigate or relieve CONTRACTOR of CONTRACTOR's safety obligations under the Contract Documents.
      b. CONTRACTOR's safety representative shall possess not less than five years of experience serving as the safety representative on projects similar to or larger in size than this Contract, and for type(s) of construction similar in nature to the Work.
      c. CONTRACTOR's safety representative shall be experienced in the types of Work to be performed under the Contract and shall be experienced with safety precautions, procedures, and equipment appropriate for the safe performance of the Work.
      d. Prior to the Effective Date of the Contract, shall have successfully completed a 30-hour OSHA Construction Safety and Health training course, and a 40-hour OSHA Hazardous Materials training course, and training for confined space entry.

e. CONTRACTOR's safety representative shall be completely experienced with and knowledgeable of all applicable health and safety Laws and Regulations and with good safety practices, and shall ensure compliance with such Laws and Regulations and practices at the Site.

f. Minimum responsibilities of CONTRACTOR's safety representative are indicated in this Section.

1.3 SUBMITTALS

A. Informational Submittals: Submit the following:

1. Emergency contact information, in accordance with Article 1.5 of this Section.
2. Citations:
   a. Copies of safety citations from authorities having jurisdiction and insurance companies, submitted within 24 hours of CONTRACTOR's receipt of such citations.
3. Qualifications Statements:
   a. CONTRACTOR's Safety Representative: Submit name and qualifications of CONTRACTOR's safety representative, including summary of experience, and training received and valid certifications and accreditations applicable to the Project.

1.4 SAFETY REPRESENTATIVE RESPONSIBILITIES

A. General:

1. CONTRACTOR's safety representative shall be at the Site full-time when Work is in progress. When CONTRACTOR employs multiple shifts, furnish more than one safety representative as necessary.
2. CONTRACTOR's safety representative shall have appropriate space at the Site to maintain and keep available safety records, up-to-date copies of pertinent safety Laws and Regulations, Material Data Sheets, CONTRACTOR's site-specific health and safety plan, copies of CITY's health and safety requirements with which CONTRACTOR shall comply, and the Site safety plan including information concerning foreseeable emergency conditions, and emergency contact information as required in Article 1.5 of this Section.

B. CONTRACTOR's safety representative's responsibilities include:

1. Duties and responsibilities in accordance with the Agreement.
2. CONTRACTOR's safety representative shall coordinate with CONTRACTOR's "competent person" required under Laws and Regulations.
3. CONTRACTOR's safety representative shall attend progress meetings in accordance with Section 01 31 19.23, Progress Meetings.
4. Schedule and conduct safety meetings and safety training programs as required by Laws and Regulations, CONTRACTOR's Site-specific health and safety plan (SSHASP), and good safety practices. Include in the SSHASP a specific schedule (dates) of such meetings and an outline of materials to be covered. Advise ENGINEER prior to the time and place of such meetings. Invite

CITY's personnel to meetings. Instruct CONTRACTOR's employees (and Subcontractors, Suppliers with personnel at the Site, and others for whom CONTRACTOR is responsible) on recognition of hazards, observance of precautions, of the contents of the SSHASP and other safety programs with which CONTRACTOR shall comply, and use of personal protective equipment (PPE) and safety equipment.

5. Determine that operators of specific construction equipment (and permanent equipment used for construction operations) are qualified by training and experience before such personnel are allowed to operate such equipment.
6. Develop and implement emergency response procedures, including names, locations, and contact telephone numbers for emergency services and medical assistance as indicated in requirements for the emergency contact list in Article 1.5 of this Section.
7. Post appropriate notices regarding health and safety Laws and Regulations at locations at the Site and CONTRACTOR's office that afford maximum exposure to personnel.
8. Post appropriate instructions and warning signs in regard to all hazardous areas and hazardous conditions that cannot be eliminated. Identification of such areas shall be based on experience, site surveillance, and severity of the associated hazard. Signage shall not be used in place of appropriate workplace controls.
9. Ascertain via personal inspection that safety Laws and Regulations and safety program requirements are enforced. Make inspections at appropriate frequencies to ensure that machines, tools, and equipment are in a safe operating condition; and that all work areas are free of hazards to the extent practicable. Implement necessary and timely corrective actions to eliminate unsafe acts and unsafe conditions, and submit to ENGINEER daily copy of findings resulting from inspection, using inspection checklist forms established in CONTRACTROR's SSHASP.
10. Submit to ENGINEER copies of safety citations from authorities having jurisdiction and insurance companies within 24 hours of CONTRACTOR's receipt of such citations.
11. Provide appropriate orientation to employees, visitors, Subcontractors, and Supplier personnel at the Site.
12. Perform all related tasks necessary to achieve the highest degree of safety that the nature of the Work allows.

1.5 EMERGENCY CONTACT INFORMATION

A. CONTRACTOR shall submit list of emergency contact information for 24-hour use throughout the Project. Emergency contact information shall be updated and kept current throughout the Project. If personnel or contact information change, furnish updated emergency contact information list at the next progress meeting.

B. CONTRACTOR's list of emergency contact information shall include:
   1. CONTRACTOR's project manager's office, field office, cellular, and home telephone numbers.
   2. CONTRACTOR's Site superintendent's office, field office, cellular, and home telephone numbers.
   3. CONTRACTOR's foreman's field office, cellular (if available), and home telephone numbers.
   4. CONTRACTOR's safety representative's office, cellular, and home telephone numbers.
   5. Major Subcontractors' and Suppliers' office, cellular, and home telephone numbers of project manager and foreman (when applicable).

C. Additional Emergency Contact Information:
   1. DEPARTMENT's Project Manager: office, cellular, and home telephone numbers.
   2. CITY's City Engineer and CITY's Assistant Superintendent of Water: office, cellular, and home telephone numbers.
   3. CITY's central 24-hour emergency telephone number at the Lake Washington Filtration Plant and Fire Department.
   4. ENGINEER's project manager's office, cellular, and home telephone numbers.
   5. ENGINEER's project engineer's office, cellular, and home telephone numbers.
   6. Resident Project Representative's office, field office, cellular, and home telephone numbers.
   7. Utility companies' 24-hour contact telephone number(s), including gas, water, sewer, oil, telephone, cable television/telecommunications, and other companies or concerns having utilities in the vicinity of the Work.
   8. Highway and street owners' 24-hour telephone number(s).
   9. Emergency telephone numbers, including: "Emergency: Dial 911", and seven-digit telephone numbers for the hospital, ambulance, police, and fire department nearest to the Site. Furnish names of each of these institutions.
   10. Other involved entities as applicable.
   11. Include with list of emergency contact information an 8.5-inch by 11-inch map showing route from the Site to the nearest hospital.

1.6 SAFETY EQUIPMENT

A. General:
   1. CONTRACTOR shall provide proper safety and rescue equipment, adequately maintained and readily available, for any foreseeable contingency.
   2. Such equipment shall include items such as safety ropes and harnesses, fall-prevention devices, stretchers, water safety devices, oxygen breathing apparatus, resuscitators, gas detectors, oxygen deficiency indicators, combustible gas detectors, fire extinguishers and first-aid equipment in accordance with the Division 01 Specifications, and similar equipment.
   3. Keep safety equipment in protected areas. Check safety equipment at scheduled intervals.

4. Temporary First-Aid Facilities: Provide and maintain in accordance with Section 01 52 16, First Aid Facilities.

B. Safety Equipment Log:
   1. Maintain a log indicating the person who checked the equipment, when equipment was checked, and that equipment was acceptable.
   2. Update equipment log not less-often than monthly.
   3. Include in safety representative's onsite records copies of equipment calibration records.

C. Provide replacement safety equipment when primary safety equipment is unavailable due to use or when undergoing maintenance.

D. Personal Protective Equipment (PPE):
   1. All persons entering the work areas shall wear appropriate PPE required for the particular area.
   2. Remove from the Site any person failing to comply with this or any other safety requirement.
   3. Continuously provide all necessary PPE for ENGINEER's employees, Resident Project Representative, and consultants. ENGINEER will furnish for ENGINEER's employees and consultants protective helmets (hard hats), safety eyewear, reflective vests, and hearing protection. CONTRACTOR shall furnish other equipment required.

1.7 EVACUATION DRILL

A. Included in CONTRACTOR's SSHASP shall be evacuation drills, conducted not less-often than once every three months, scheduled and conducted by CONTRACTOR under supervision of CONTRACTOR's safety representative.

B. Perform evacuation drill during regular working hours, scheduled to minimize disruption of the Work.

C. Upon evacuation, CONTRACTOR and all personnel for whom CONTRACTOR is responsible, immediately advise ENGINEER's onsite personnel and CITY staff that all personnel have been evacuated.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

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SECTION 01 35 44

SPILL PREVENTION CONTROL AND COUNTERMEASURES PLAN

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section pertains to spill prevention control and countermeasures applicable to the Project under the provisions of 40 CFR 112 and other Laws and Regulations.
   2. CONTRACTOR shall provide all labor, materials, equipment, tools, professional services (when required), and incidentals as shown, specified, and required to comply with Laws and Regulations regarding spill prevention control and countermeasures (SPCC) planning and compliance, including 40 CFR 112.
   3. Multiple Prime Contracts:
      a. General CONTRACTOR shall determine whether a SPCC Plan is required. Other prime contractors shall furnish to General CONTRACTOR information and data relative to the work under their respective contracts as necessary for determining whether the Project requires a SPCC Plan.
      b. When SPCC Plan is required, General CONTRACTOR shall prepare, implement, and maintain SPCC Plan as required by Laws and Regulations.
      c. In cooperation with the General CONTRACTOR, each prime contractor at the Site shall implement the SPCC Plan for tanks at the Site used by such prime contractor.
      d. General CONTRACTOR shall have overall responsibility for the Project's SPCC Plan.

1.2 DETERMINATION OF NEED FOR SPCC PLAN FOR PROJECT

A. Determination of Need for SPCC Plan:
   1. CONTRACTOR shall determine need for SPCC Plan for the Project.
   2. CONTRACTOR's Professional Engineer:
      a. If the Site will include storage of more than 10,000 gallons of oil in above-ground storage, or if the Site does not comply with oil discharge history criteria specified in 40 CFR 112, CONTRACTOR shall retain a qualified professional engineer to determine need for SPCC Plan for the Project and, if SPCC Plan is required, professional engineer shall prepare or supervise preparation of SPCC Plan for the Project.
      b. If a professional engineer is not required to prepare the full SPCC Plan for the Project, but the SPCC Plan includes environmentally-equivalent SPCC measures, or impracticality determinations, CONTRACTOR shall retain a qualified professional engineer to

prepare and certify those portions of the SPCC Plan dealing with environmentally equivalent measures and impracticality determinations; the balance of the SPCC Plan may be prepared by and be self-certified by CONTRACTOR.

3. Submit to ENGINEER letter presenting results of evaluation of whether a SPCC Plan is required for the Project in accordance with Laws and Regulations.

B. SPCC Plan is required when the Project activities at the Site meet the following criteria:
   1. The Site and activities thereon are not exempt from Laws and Regulations relative to SPCC planning and implementation.
   2. Oil is stored, used, transferred, or otherwise handled at the Site, unless otherwise exempted by Laws and Regulations.
   3. Maximum oil storage capacity at the Site equals or exceeds either of the following thresholds: 42,000 gallons of completely-buried capacity, or 1,320 of above-ground capacity. Capacity includes total storage tank volume and operational storage volume at the Site for contractors and Subcontractors, including bulk storage tanks, containers with 55-gallon storage capacity and larger, mobile tanks located at the Site, and other containers covered by Laws and Regulations. Exempt are motive storage containers, such as those on construction equipment and vehicles. Oil includes petroleum products, fuel oil, hydraulic fluid, oil sludge, oil refuse, oil mixed with wastes other than dredged material, synthetic oil, vegetable oil, animal fats and oils, and other oils defined in Laws and Regulations.
   4. There is reasonable expectation, based on location of the Site, that oil spill would reach navigable waters of the United States or adjoining shorelines.

C. When SPCC Plan is not required, CONTRACTOR shall ensure that conditions that preclude the need for SPCC Plan for the Project, including the activities of all contractors and Subcontractors working on the Project at the Site, are maintained throughout duration of the Project. Should changes that affect the storage, use, or handling of oil at the Site occur, reassess the need for SPCC Plan for the Project at no additional cost to DEPARTMENT and submit to ENGINEER evaluation letter regarding need for SPCC Plan.

1.3 SPCC PLAN AND IMPLEMENTATION

A. When SPCC Plan is required, develop SPCC Plan and submit for acceptance by DEPARTMENT, with copy to ENGINEER. SPCC Plan shall be specific to the Site and the Project and shall include the following:
   1. Seal or stamp, original signature, and license number of CONTRACTOR'S professional engineer, when self-certification by CONTRACTOR is not allowed by Laws and Regulations.
   2. Site plan identifying the name (or tag number) and location of each tank and container that will contain a substance regulated in 40 CFR 112 and other Laws and Regulations, including above-ground and buried tanks. Site plan shall indicate general directions of storm water runoff, including storm

sewers and drainage inlets (including arrows indicating directions of flow), and storm sewer outfall locations shown and labeled.

3. For each tank and container shown or indicated on the Site plan, include a table that lists the tank or container's name and tag number, type of oil stored therein, and maximum storage capacity. List total storage capacity of all regulated tanks and containers at the Site covered by SPCC Laws and Regulations.
4. Predictions of direction, rate of flow, and total quantity of oil that could be discharged from the Site as result of storage tank or container failure.
5. Operating procedures that prevent oil spills, including procedures for oil handling, details of secondary containment structures at fuel and oil transfer areas, and details and descriptions of equipment to be used for oil handling, including piping.
6. Control Structures and Secondary Containment:
    a. Furnish details of and descriptions of control measures installed at the Site by CONTRACTOR to prevent spill from reaching navigable waters of the United States and associated shorelines, including secondary containment and diversionary structures.
    b. For on-shore Sites, one of the following must be used, at minimum: dikes, berms, or retaining walls; curbing; culverts, gutters, or other drainage systems; weirs, booms, or other barriers; spill diversion ponds; retention ponds; or sorbent materials.
    c. Where appropriate, the SPCC Plan shall clearly demonstrate that containment or diversionary structures or equipment are not practical.
    d. Include brittle fracture evaluation, where required, for field-constructed above-ground storage containers undergoing repair, alteration, construction, or change in service.
7. Plans for countermeasures to contain, clean up, and mitigate effects of oil spill that reaches navigable waters of the United States or their shorelines, including written commitment of manpower, equipment, and materials to quickly control and remove spilled oil. Include estimation of time required to contain spill after spill occurs.
8. Contact list and telephone numbers for facility response coordinator, National Response Center, cleanup contractors, and all appropriate federal, state, and local authorities having jurisdiction to be contacted in event of spill or discharge.
9. Program for monthly inspections of the Site by CONTRACTOR for SPCC Plan compliance. Advise DEPARTMENT in writing of each inspection not less than 72 hours in advance.
10. Measures for Site security relative to oil storage.
11. Procedures for safely handling mobile containers such as totes, drums, and fueling vehicles and construction equipment that remain at the Site.
12 Procedures and schedules for periodic testing of integrity of tanks and containers, and associated piping and valves.
13. Plans for bulk storage container compliance.
14. Plans for personnel training and oil spill prevention briefings.

15. For SPCC Plans that do not follow the format listed in Laws and Regulations, provide cross-reference to requirements of Laws and Regulations, including 40 CFR 112.7.

B. Obtain acceptance of SPCC Plan by DEPARTMENT, for coordination with DEPARTMENT's Site-specific SPCC Plan, if any.

C. SPCC Plan shall be reviewed by CONTRACTOR's professional engineer (when professional engineer is required) and DEPARTMENT every five years, as applicable. CONTRACTOR shall perform updates and revisions of the Project's SPCC Plan as necessary and submit same in accordance with the provisions of this Section for submittal and acceptance of initial SPCC Plan.

D. Post a copy of accepted, certified SPCC Plan in conspicuous location at the Site and furnish copies to DEPARTMENT, ENGINEER, other contractors, and Subcontractors as appropriate. All contractors shall comply with SPCC Plan.

E. In event of violation of SPCC Plan or release of oils attributable to construction operations, CONTRACTOR shall:
   1. Immediately issue notifications in accordance with Laws and Regulations, including 40 CFR 110 and 40 CFR 112. When required by Laws and Regulations, report to National Response Center, US Environmental Protection Agency, and other authorities having jurisdiction, if any.
   2. Have spill clean-up performed in accordance with Laws and Regulations, the SPCC Plan, and requirements of authorities having jurisdiction.
   3. Pay fines and civil penalties (or responsible portion thereof) imposed on DEPARTMENT by authorities having jurisdiction, and pay costs associated with clean-up of spills.
   4. Should cleanup of spills attributable to CONTRACTOR be necessary, no resulting change in the Contract Price or Contract Times will be allowed. Should CONTRACTOR share responsibility for spill and cleanup with another entity, changes in Contract Price and Contract Times, if any, will be proportionate.

1.4 QUALITY ASSURANCE

A. Qualifications:
   1. CONTRACTOR's Professional Engineer:
      a. When required by Laws and Regulations, engage a licensed, registered professional engineer legally qualified to practice in the jurisdiction where the Site is located and experienced in performing engineering services of the type required.
      b. Submit qualifications data.
      c. Responsibilities include but are not necessarily limited to:
         1) Carefully reviewing Laws and Regulations relative to SPCC.
         2) Preparing written requests for clarifications or interpretations of criteria specified in the Contract Documents for submittal to ENGINEER by CONTRACTOR, and obtaining from authorities

having jurisdiction clarifications regarding Laws and Regulations as required.

3) Preparing or supervising the preparation of letter-report evaluation of need for SPCC Plan in accordance with the Contract Documents. Evaluation shall include professional engineer's seal or stamp, registration number, and original signature.
4) When SPCC Plan is required, preparing, supervising the preparation of, or reviewing the SPCC Plan (or designated portions thereof when oil storage at the Site will be 10,000 gallons or less) in accordance with the Contract Documents. SPCC Plan (or designated portions thereof) shall include professional engineer's seal or stamp, registration number, and original signature.
5) Periodically re-evaluating the need for SPCC Plan and issuing findings as letter-reports with seal or stamp, license number, and signature. When SPCC Plan is required, periodically evaluating the SPCC Plan and providing recommendations for compliance with Laws and Regulations, in accordance with the Contract Documents.
6) Certifying that:
   a) it is familiar with the Laws and Regulations, including 40 CFR 112, and
   b) it has visited, examined, and is familiar with the Site, planned modifications to the Site under the Project as such modifications pertain to SPCC Laws and Regulations, and
   c) it has performed the evaluations and prepared SPCC Plan in accordance with the Contract Documents, and
   d) procedures for required testing and inspections have been established, and
   e) the said evaluations and SPCC Plan are adequate for the Project, and
   f) the said evaluations and SPECC Plan complies with Laws and Regulations, applicable industry standards, and to prevailing standards of practice.

1.5 SUBMITTALS

A. Informational Submittals: Submit the following:
   1. Certifications: With each evaluation letter and SPCC Plan submittal, include certification signed by preparer of submittal that the submittal complies with the Contract Documents and Laws and Regulations. Signature on all certifications shall be original.
   2. Evaluations:
      a. Submit letter presenting results of evaluation of whether a SPCC Plan is required for the Project. Submit evaluation not later than fourteen days after the Contract Times commence running, unless longer time is allowed by ENGINEER.
      b. Submit updated evaluations as required when conditions at the Site change. Submit updated evaluation not later than seven days after the

conditions at the Site change, or within seven days of ENGINEER's request, unless longer time is allowed by ENGINEER.

3. SPCC Plan: When SPCC Plan is required:
   a. Submit jointly to DEPARTMENT and ENGINEER. Submit within 14 days of receipt of ENGINEER's acceptance of evaluation submittal.
   b. Update and resubmit the SPCC Plan, or acceptable SPCC Plan amendments, as required when conditions at the Site change. Submit updated SPCC Plan or amendments not later than seven days after the change in conditions at the Site change giving rise to the SPCC Plan change or amendment, or within seven days of ENGINEER's request, unless longer time is allowed by ENGINEER.
4. SPPC Plan Distribution: When SPCC Plan is required, submit copies of letters transmitting SPCC Plan and amendments (if any) to contractors and Subcontractors working at the Site.
5. Qualifications Statements: CONTRACTOR's professional engineer, when requested by ENGINEER or DEPARTMENT.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 35 73

DELEGATION OF PROFESSIONAL DESIGN

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This section includes requirements and CONTRACTOR's responsibilities for performing professional design services ("delegated design") as part of the Work under the Contract. This section also includes requirements for professional liability insurance furnished by CONTRACTOR or Subcontractor.
   2. CONTRACTOR shall provide labor, professional services, and incidentals shown, specified, and required for performing delegated designs of elements of the permanent Work.
   3. CONTRACTOR is delegated the professional design of the following:
      a. Metal building system.
      b. Segmental retaining wall system.
      c. Aluminum stairs.
      d. Aluminum handrails and railings.
      e. HVAC hangers and supports.
   4. Requirements of this section relative to allocation of responsibilities for delegated designs applies for all delegated design Work under the Contract, regardless of whether such design is delegated under this section or elsewhere in the Contract Documents.

B. Coordination:
   1. Review installation procedures under other Specifications sections and coordinate the installation of items that must be installed with, or before, the delegated design Work.
   2. Notify other Contractors in advance of the installation of work that is delegated design to provide such other contractors with sufficient time for the installation of items that must be installed with, or before, the delegated design Work.
   3. Coordinate delegated designs with the design delegation under Section 40 05 96, Vibration, Seismic, and Wind Controls, and other Specifications sections.

C. Related Sections:
   1. Section 01 45 33, Code-required Special Inspections and Procedures.
   2. Section 05 51 17, Aluminum Stairs.
   3. Section 05 52 15, Aluminum Handrails and Railings.
   4. Section 13 34 19, Metal Building Systems.

5. Section 23 05 29, Hangers and Supports for HVAC Ductwork, Piping and Equipment.
6. Section 40 05 96, Vibration, Seismic and Wind Controls.

1.2 QUALITY ASSURANCE

A. Qualifications:
   1. CONTRACTOR's Professional Engineer:
      a. CONTRACTOR or Subcontractor shall retain registered professional engineer legally qualified to practice in the same jurisdiction as the Site and possessing current, valid license and registration for professional engineering in the same state as the Site.
      b. Professional engineer responsible for design of pre-engineered building shall have not less than 10 years of experience in designing similar structures.
      c. Each of CONTRACTOR's professional engineer(s) of record performing delegated design and that will seal and sign work product associated therewith shall document, as part of qualifications statement submittal, similar experience serving as an engineer-in-responsible-charge for not less than five completed projects of similar complexity to this Project. Submit for each the project name, approximate value of construction for which the engineer was in responsible charge, date(s) of project, location of project, brief description of the materials, equipment, and systems designed, and name and contact information for such engineer's client for the project.
      d. Responsibilities include:
         1) Reviewing system performance and design criteria stated in the Contract Documents.
         2) Preparing written requests for clarifications or interpretations of performance or design criteria for submittal to ENGINEER by CONTRACTOR.
         3) Preparing or supervising preparation of design calculations, design drawings of piping systems and supporting structures, and related Shop Drawings.
         4) Signing and sealing all calculations, design drawings, and Shop Drawings.
         5) Reviewing and approving product data and Shop Drawings for items designed or specified by CONTRACTOR's professional engineer.
         6) Certifying that:
            a) Design of the pre-engineered building has been performed in accordance with performance and design criteria indicated in the Contract Documents, and
            b) Design complies with specified design standards and all applicable local, state, and federal laws, rules, codes, ordinances, and regulations ("Laws and Regulations"), standards commonly applicable to such types of construction, and to prevailing

standards of practice.

B. Regulatory Requirements:
   1. Comply with Laws and Regulations governing the practice of professional engineering in the State of New York.
   2. Governing Building Code: Building Code of New York State, as may be modified by local codes or ordinances.

C. Pre-Design Conference:
   1. Before commencing the design delegated to CONTRACTOR, attend a meeting at the Site to discuss the requirements for delegated design.
   2. Required Attendees: CONTRACTOR's project manager, CONTRACTOR's professional engineer, representatives of affected Subcontractors, and ENGINEER.
   3. ENGINEER will schedule and chair the meeting and prepare and distribute to attendees and DEPARTMENT and CITY a record of the topics discussed at the meeting, action items for participants, and decisions made.
   4. Meeting shall be held following acceptance of qualifications of CONTRACTOR's professional engineer by ENGINEER and prior to preparation of the delegated design submittals.

1.3 SUBMITTALS

A. Furnish submittals required in the Specifications and elsewhere in the Contract Documents. Submittals required in this section apply to all types of delegated design services and associated Work.

B. Action Submittals: Submit the following;
   1. Delegated Design Submittals:
      a. Structural design calculations, including building foundation reactions and building frame design.
      b. Design drawings and Shop Drawings (approved by CONTRACTOR's professional engineer) for foundation design and building primary and secondary building frame design.
      c. Design modifications designed by CONTRACTOR's professional engineer to substantiate changes to the design during construction.

C. Informational Submittals: Submit the following:
   1. Qualifications Statements:
      a. CONTRACTOR's professional engineer. Submit qualifications not more than five days after the Contract Times commence running.

1.4 ALLOCATION OF RESPONSIBILITIES

A. Delegation of Professional Design Responsibility – General

1. CONTRACTOR will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out CONTRACTOR's responsibilities for construction means, methods, techniques, sequences and procedures. CONTRACTOR shall not be required to provide professional services in violation of applicable Laws and Regulations.
2. If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of CONTRACTOR by the Contract Documents, DEPARTMENT and ENGINEER will specify performance and design criteria that such services must satisfy. CONTRACTOR shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to ENGINEER.
3. DEPARTMENT and ENGINEER shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals, provided DEPARTMENT and ENGINEER have specified to CONTRACTOR performance and design criteria that such services must satisfy.
4. Pursuant to this paragraph, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 5.28 of the General Conditions.
5. CONTRACTOR shall not be responsible for the adequacy of the performance or design criteria specified by DEPARTMENT or ENGINEER.

B. Contractor's Professional Liability Insurance:
1. General Provisions:
   a. If CONTRACTOR will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then CONTRACTOR shall be responsible for purchasing and maintaining applicable professional liability insurance. Such insurance shall provide protection against claims arising out of performance of professional design or related services, and caused by a negligent error, omission, or act for which the insured party is legally liable.
   b. Professional liability insurance shall be maintained throughout the duration of the Contract and, notwithstanding other provisions of the Contract Documents regarding duration of CONTRACTOR-furnished

insurance, shall remain in effect for not less than two years after Substantial Completion.

c. If such professional design services are performed by a Subcontractor, and not by CONTRACTOR itself, then the requirements of this Paragraph 1.4.B may be satisfied through the purchasing and maintenance of such insurance by such Subcontractor.

2. Submit evidence of required professional liability insurance coverage as required by the insurance requirements of the Contract, prior to the performance of professional services under the Contract.
3. Requirements for insurance carriers for professional liability insurance shall comply with the requirements for insurers elsewhere in the Contract Documents. In addition, professional liability insurance carrier shall be licensed to furnish such insurance in the jurisdiction where the Site is located and shall have an A.M. Best rating of VII-A or better.
4. Required Coverage Limits:
   a. Each Claim: $1,000,000.
   b. Annual Aggregate: $1,000,000

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

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SECTION 01 41 24

PERMIT REQUIREMENTS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes general requirements relative to permitting requirements of which OWNER and ENGINEER are aware that apply to the Project.
   2. CONTRACTOR shall provide labor, materials, equipment, tools, and incidentals shown, specified, and required to obtain required permits and comply with required permits and licenses.
   3. Obtain, pay for, and comply with required permits and licenses whether or not indicated in this Section or elsewhere in the Contract Documents.

B. Coordination:
   1. Coordinate compliance with permit and license requirements with Work under other Sections and with other contractors, if any, working at the Site.
   2. Coordinate with the Progress Schedule the time required to apply for and obtain required permits and licenses. Changes in Contract Times or Contract Price will not be authorized because of timing and costs associated with obtaining permits and licenses required for the Work.

C. Related Sections: In addition to permits and licenses required under this Section, obtain and comply with permits required under the following Sections:
   1. Section 01 14 33, Work in Highway Rights-of-Way.
   2. Section 01 35 43.13, Environmental Procedures for Hazardous Materials.
   3. Section 01 41 28, Confined Space Entry Permit.

1.2 SUBMITTALS

A. Informational Submittals: Submit the following:
   1. Copy of each of the following permits as applicable to the Contract:
      a. None.

1.3 MUNICIPAL PERMITS AND LICENSES

A. Permits:
   1. Building permit is not required for the Project. No other municipal permits apply to the Project.

B. Licenses:
   1. Electrical CONTRACTOR shall have a valid electricians license granted by Orange County.

1.4 New York State Public Water Supply

A. CITY operates the Washington Lake Filtration Plant designated PSW No. NY3503549.
B. The New York State Department of Health's and Orange County Health Department's endorsements and/or approvals are required to be obtained prior to commencing various activities for tie-ins, start-up, etc. The ENGINEER, DEPARTMENT and CITY be responsible for coordinating approvals with the New York State Department of Health and Orange County Health Department.
C. CONTRACTOR will be responsible for disinfection of water mains, hydraulic structures and equipment and performing testing for bacteria as required in Section 01 14 16, Coordination with City's Operations and Section 01 45 29.13, Testing Laboratory Services Furnished by Contractor.
D. DEPARTMENT and ENGINEER will be responsible for clearance testing specific to Part 5 protocols and PFCs for DEPARTMENT furnished GAC Contactor Systems as described in Section 01 14 16, Coordination with City's Operations.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 41 28

CONFINED SPACE ENTRY PERMIT

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CITY has determined that portions of the Site may constitute confined spaces or permit-required confined spaces, as defined in this Section.
   2. CONTRACTOR shall provide appropriate measures, including labor, supervision, equipment, protective devices, and incidentals, to protect the health and safety of personnel at the Site relative to confined spaces, and who may be affected by the Work in confined spaces including, without limitation: employees and agents of CONTRACTOR, Subcontractors, Suppliers, DEPARTMENT, CITY, ENGINEER, and ENGINEER's consultants, while engaged in performance of their respective duties at Site.
   3. Comply with requirements of CITY's confined space entry permitting program, if any.

1.2 TERMINOLOGY

A. The following words or terms are not defined but, when used in this Section, have the following meaning:
   1. "Confined spaces" are areas on or about the Site as defined in 29 CFR 1910.146(b), 29 CFR 1926.21(b)(6), and other Laws and Regulations. Confined spaces include, but are not limited to: storage tanks, process vessels, bins, boilers and similar spaces; ventilation or exhaust ducts and stacks; manholes, underground utility vaults and chambers, sewers, pipelines, tunnels; and open-topped spaces greater than four feet deep, such as pits, tubs, vaults, and vessels.
   2. "Entry permit" means the written or printed document provided by the employer of personnel entering permit-required confined space, to allow and control entry into permit-required confined space and that contains the information specified in 29 CFR 1926.146(f), and other Laws and Regulations.
   3. "Permit-required confined space" means confined space as defined in 29 CFR 1926.146(b) and other Laws and Regulations, and that has one or more of the following characteristics:
      a. Contains or has potential to contain a hazardous atmosphere.
      b. Contains material that has potential for engulfing an entrant.
      c. Has internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or floors, or by floor that slopes downward and tapers to a smaller cross-section.
      d. Contains other recognized serious safety or health hazard.

4. "Hot work permit" means the written authorization of employer of personnel entering a confined space to perform operations, such as riveting, welding, cutting, burning, and heating, capable of providing a source of ignition.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with Laws and Regulations related to protecting personnel working in or entering confined spaces, including:
   1. Code of Federal Regulations (CFR), Title 29, Part 1910, Occupational Safety and Health Standards.
   2. CFR, Title 29, Part 1926, Safety and Health Regulations for Construction.

1.4 SUBMITTALS

A. Informational Submittals: If acceptable, written response for Informational Submittals required in this Section will not be returned to CONTRACTOR. Submit the following to CITY; if submittals under this Section are furnished to ENGINEER, ENGINEER will forward all submittals under this Section to CITY without review.
   1. Plan: Site-specific confined space entry plan, submitted upon request of the CITY.
   2. Permits and Reports: For each time personnel enter a confined space, copies of completed permits required for confined space entry, and completed confined space data sheets, submitted upon request of the CITY.

1.5 CONFINED SPACE ENTRY PLAN

A. Prepare, maintain, and implement Site-specific confined space entry plan which shall be incorporated into CONTRACTOR's Site-specific health and safety plan. Maintain copy of the confined space entry plan at the Site for access by employees, DEPARTMENT, CITY, and authorities having jurisdiction. Confined space entry plan shall include:
   1. Results of CONTRACTOR's Site-specific hazard assessment to identify confined spaces that are permit-required confined spaces, including list of all such spaces that will be accessed for the Work. Update the list as required throughout the Project.
   2. Requirements for safeguarding access to, and restricting non-permitted personnel from accessing, permit-required confined spaces during the Project.
   3. Project-specific procedures to be followed when entering or accessing permit-required confined spaces.
   4. Documentation of training provided to each person that will enter, or work in conjunction with entry to, permit-required confined spaces
   5. Update the plan by adding copies of permits issued and records of entry to permit-required confined spaces, as required in Article 1.6 of this Section.

1.6 CONFINED SPACE SAFETY

A. Personnel entering confined space shall be trained in accordance with 29 CFR 1926.21 (b)(6), 29 CFR 1910.146(g), and other Laws and Regulations.

B. Comply with 29 CFR 1910.146, other Laws and Regulations, and requirements of authorities having jurisdiction.

C. Recordkeeping: Using the example forms attached to this Section, or other forms required by CONTRACTOR, DEPARTMENT, CITY, or authority having jurisdiction, issue for each instance of access to permit-required confined space, completed permit(s) and complete associated data sheet. File completed permits and data sheets in the Site-specific confined space entry plan, and submit in accordance with Article 1.4 of this Section. Such permits and information shall include:
   1. Permit for entry to permit-required confined space(s).
   2. Permit for hot work in permit-required confined space(s).
   3. Complete confined space data sheet.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 SUPPLEMENTS

A. The example forms listed below, following this Section's "End of Section" designation, are part of this Specifications Section:
   1. "Confined Space Data Sheet" (one page).
   2. "Confined Space Entry Permit (two pages).
   3. "Confined Space Hot Work Permit" (one page).

+ + END OF SECTION + +

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CONFINED SPACE DATA SHEET

Name of Confined Space Entered: _____

Location of Confined Space Entered: _____

_____

Contractor/Subcontractor Accessing Confined Space: _____

_____

PRE-ENTRY SYSTEM CONTROLS USED

		Check
Mechanical:	Isolate, lockout and de-energize to zero potential energy.	☐
Engulfment:	Blank/block/cap/bleed off lines. Lock out gates, valves, pumps.	☐
Electrical:	Lockout/Tag-out	☐
Inerting:	Flush/Purge/Vent	☐

Special Precautions: _____

_____

ATMOSPHERE RESULTS

Date of Last-measured Values: _____

	Oxygen	Explosive	H_2S/Toxic	CO	Date/Time Completed	Initials
Permissible Range	19.5%-23.5%	< 10% LFL	< 10 ppm H_2S	< 35 ppm	--	--
Last Measured						
Values This Entry						

SITE AND PERSONNEL SAFETY (check if required, list type where applicable)

Personal Protective Equipment (PPE) Used:
Safety Harness ☐. Life Lines ☐. Hard Hats ☐. Fall Protection ☐. Retrieval ☐. Eye ☐. Ear ☐. Face ☐. Hand ☐.
Foot ☐. Respiratory ☐ (type) _____. Clothing ☐ (type) _____
Other: ☐ _____

_____

Rescue and Emergency Equipment On-Hand/Used:
Retrieval Equipment ☐. Fire Extinguishers ☐. Radios/Telephone ☐. Ladder ☐. Other ☐ _____
Equipment on Standby for Rescue Personnel ☐ _____

_____

Site Safety Equipment/Items On-Hand/Used:
Explosion-Proof Lighting ☐. Barriers/Shield/Barricades ☐ (type) _____. Postings/Flagging ☐.
Other ☐ _____

List specific equipment that was isolated, de-energized, and locked out.

_____

CONFINED SPACE ENTRY PERMIT

ENTRY TEAM

Contractor/Subcontractor Accessing Confined Space: _____

Site or Facility: _____

Specific Confined Space to be Entered: _____

Purpose of Entry (describe the work to be performed): _____

_____

_____

_____

Date: _____ **Time:** _____ **Expected Job Duration (days/hours):** _____

Entry Supervisor: _____ **Designated Attendant:** _____

Authorized/Qualified Entrants: _____ _____

_____ _____

_____ _____

Entry Team Rotation:

Date: _____ **Time:** _____

Entry Supervisor: _____ **Designated Attendant:** _____

Authorized/Qualified Entrants: _____ _____

_____ _____

_____ _____

Entry Team Rotation:

Date: _____ **Time:** _____

Entry Supervisor: _____ **Designated Attendant:** _____

Authorized/Qualified Entrants: _____ _____

_____ _____

_____ _____

Communication Procedures:

Entry Team: _____

_____

_____

Standby/Rescue Personnel: _____

_____

_____

Sign-Offs:

Person Authorizing this Entry: _____

Entry Supervisor: _____

Person Terminating Permit: _____ **Date:** _____ **Time:** _____

Distribution to: _____ _____ _____

Attach to this permit a list of rescue and emergency services that can be summoned and the means (such as the equipment to use and the telephone numbers to call) for summoning such emergency services.

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Confined Space Entry Permit (PAGE 2 of 2)

PRE-ENTRY SYSTEM CONTROL

		Check	Date/Initials
Mechanical:	Isolate, lockout and de-energize to zero potential energy.	Completed ☐	_____
Engulfment:	Blank/block/cap/bleed off lines. Lock out gates, valves, pumps.	Completed ☐	_____
Electrical:	Lockout/Tag-out	Completed ☐	_____
Inerting:	Flush/Purge/Vent	Completed ☐	_____

Special Precautions: _____

_____

_____

ATMOSPHERE - Tested by portable atmospheric monitor with audible and visual alarms.
No one will enter a space with an unsafe atmosphere without approval from the Contractor Superintendent.

	Oxygen	Explosive	H_2S/Toxic	CO	Date/Time Completed	Initials
Permissible Range	19.5%-23.5%	< 10% LFL	< 10 ppm H_2S	< 35 ppm	--	--
Pre-Entry						
Post Ventilation						
Continuous						
Continuous						
Continuous						

Ventilation Used (circle one): Mechanical Natural
Special Precautions: (See Confined Space Data Sheet) _____

_____

SITE AND PERSONNEL SAFETY (check if required, list type where applicable)

Personal Protective Equipment (PPE) Required:
Safety Harness ☐. Life Lines ☐. Hard Hats ☐. Fall Protection ☐. Retrieval ☐. Eye ☐. Ear ☐. Face ☐. Hand ☐.
Foot ☐. Respiratory ☐ (type) _____. Clothing ☐ (type) _____.
Other: ☐ _____

_____

Rescue and Emergency Equipment Required:
Retrieval Equipment ☐. Fire Extinguishers ☐. Radios/Telephone ☐. Other ☐ _____.
Equipment on Standby for Rescue Personnel ☐ _____

_____

Site Safety Equipment/Items Required:
Explosion-Proof Lighting ☐. Barriers/Shield/Barricades ☐ (type) _____. Postings/Flagging ☐.
Other ☐ _____.

List specific equipment to be isolated, de-energized, and locked out.

_____

CONFINED SPACE HOT WORK PERMIT

Contractor/Subcontractor Accessing Confined Space for Hot Work: _____

_____

Site or Facility:_____

Specific Confined Space to be Entered: _____

_____

Date:_____**Time:**_____

Expected Job Duration (days/hours):_____

Purpose of Entry (describe the work to be done):_____

_____

_____

_____

Explain Why Work Cannot be Done Outside of the Confined Space:_____

_____

_____

_____

Safety Equipment Required:

Fire Extinguishers: **Yes** _____ **No**_____ **Number**_____

Type_____

Respirators: **Yes** _____ **No**_____ **Number**_____

Type_____

Other Equipment: _____

_____

Authorizing Supervisor:

Print Name _____

Signature _____

Date Signed _____

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SECTION 01 42 00

REFERENCES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Section includes the following:
      a. Definitions and terminology in general use in the Contract Documents.
      b. Applicable codes.
      c. Abbreviations in general use throughout the Contract Documents.
      d. General requirements regarding reference standards, including a listing of standard-issuing organizations (and their acronyms) used in the Contract Documents.

1.2 DEFINITIONS AND TERMINOLOGY

A. Definitions and terminology applicable to all the Contract Documents are included in the General Conditions, as may be modified by the Supplementary Conditions.

B. Additional terminology used in the Contract Documents includes the following:
   1. "Indicated" refers to graphic representations, notes, or schedules on the Drawings, or to other paragraphs, provisions, tables, or schedules in the Specifications and similar locations in the other Contract Documents. Terminology such as "shown", "noted", "scheduled", and "specified" are used to help the user locate the reference without limitation on the location.
   2. "Installer", "applicator", or "erector" is CONTRACTOR or another person or entity engaged by CONTRACTOR, either as an employee or Subcontractor, to perform a particular construction activity, including installation, erection, application, or similar Work. Installers shall be experienced in the Work that installer is engaged to perform.
      a. The term "experienced", when used in conjunction with the term "installer", means having successfully completed not less than five previous projects similar in size and scope to this Project; being familiar with the special requirements indicated and required; being familiar with Laws and Regulations; and having complied with requirements of authorities having jurisdiction, and complying with requirements of the Supplier of the material or equipment being installed, unless other experience requirements specific to that element of the Work are indicated elsewhere in the Contract Documents.
   3. Trades: Use of terms such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter", unless

otherwise indicated in the Contract Documents or required by Laws or Regulations. Such terminology also does not imply that specified requirements apply exclusively to trade personnel of the corresponding generic name.

4. "Assigned specialists" and similar terms: Certain Sections of the Specifications require that specific construction activities be performed by specialists with recognized, extensive experience in such operations. Engage said specialists for such activities, and their engagement is a requirement over which CONTRACTOR has no option. These requirements do not conflict with enforcement of building codes and other Laws and Regulations. Also, such requirements are not intended to interfere with local trade union jurisdictional settlements and similar conventions. Such assignments shall not relieve CONTRACTOR of responsibility for complying with the requirements of the Contract Documents.

1.3 APPLICABLE CODES

A. References in the Contract Documents to local code(s) shall mean the following:
   1. Building Code of New York State.
   2. National Electric Code in effect at the location of the Project.
   3. NFPA 101, Life Safety Code.

1.4 ABBREVIATIONS

A. Common abbreviations that may be found in the Contract Documents are indicated below, alphabetically by their written-out meaning:

alternating current	a-c
ampere	A
antemeridian	a.m.
Architectural Barriers Act	ABA
Americans with Disabilities Act	ADA
Americans with Disabilities Act Accessibility Guidelines	ADAAG
ante meridian	a.m.
average	avg
biochemical oxygen demand	BOD
five-day biochemical oxygen demand	BOD_5
brake horsepower	bhp
British thermal unit	Btu
building information model	BIM
carbonaceous biochemical oxygen demand	CBOD
five-day carbonaceous biochemical oxygen demand	$CBOD_5$
chemical oxygen demand	COD

Centigrade (or Celsius)		C
chlorinated polyvinyl chloride		CPVC
chlorofluorocarbons		CFC
Code of Federal Regulations		CFR
computer-aided drafting and design		CADD, or CAD
cubic inch		cu in
cubic foot		cu ft
cubic yard		cu yd, or CY
cubic feet per minute		cfm
cubic feet per second		cfs
decibel		db
degree Centigrade (or Celsius)	(Write)	degrees C, ºC, or deg C
degrees Fahrenheit		degrees F, ºF, or deg F
diameter		dia
direct current		d-c
dollars		$
each		ea
efficiency		eff
Fahrenheit		F
feet		ft
feet per hour		fph, or ft/hr
feet per minute		fpm
feet per second		fps, or ft/min
figure		fig
flange		flg
foot-pound		ft-lb
gallon		gal
gallons per hour		gph, or gal/hr
gallons per minute		gpm
gallons per second		gps
gram		g
grams per liter		g/L
Hertz		Hz
horsepower		hp or HP
hour		hr
human-machine interface		HMI

inch	in.
inches of mercury	in. Hg
inches water gage	in. w.g.
inch-pound	in.-lb
inside diameter	ID
iron pipe size	IPS
thousand pounds	kips
thousand pounds per square inch	ksi
kilovolt-ampere	kva
kilowatt	kw
kilowatt-hour	kwhr or kwh
linear foot	lin ft or LF
liter	L
Leadership in Energy and Environmental Design (USGBC)	LEED
maximum	max
mercury	Hg
milligram	mg
milligrams per liter	mg/l or mg/L
milliliter	ml
millimeter	mm
million gallons per day	mgd or MGD
million gallon	MG
minimum	min
national pipe threads	NPT
net positive suction head	NPSH
net positive suction head available	NPSHA
net positive suction head required	NPSHR
nitrogen oxide (total concentration of mono-nitrogen oxides such as nitric oxide (NO) and nitrogen dioxide (NO_2))	NOx
nominal pipe size	NPS
number	no.
operator interface terminal	OIT
ounce	oz
ounce-force	ozf
outside diameter	OD
parts per hundred	pph

parts per million	ppm
parts per billion	ppb
polyvinyl chloride	PVC
post meridian	p.m.
pound	lb
pounds per square inch	psi
pounds per square inch absolute	psia
pounds per square inch gauge	psig
pounds per square foot	psf
process control system	PCS
programmable logic controller	PLC
revolutions per minute	rpm
second	sec
specific gravity	sp gr, or SG
square	sq
square foot	sq ft, sf, or ft^2
square inch	sq in., or in^2
square yard	sq yd, or SY
standard	std
standard cubic feet per minute	scfm
total dynamic head	TDH
totally-enclosed fan-cooled	TEFC
volt	V
volts alternating current	vac
volts direct current	vdc
volatile organic compounds	VOC

1.6 REFERENCE STANDARDS

A. Refer to Article 3 of the General Conditions, as may be modified by the Supplementary Conditions, relative to reference standards and resolving discrepancies between reference standards and the Contract Documents. Provisions of reference standards are in effect in accordance with the Specifications.

B. Copies of Standards: Each entity engaged in the Work shall be familiar with reference standards applicable to its construction activity. Copies of applicable reference standards are not bound with the Contract Documents. Where reference standards are needed for a construction activity, obtain copies of standards from the publication source.

C. Abbreviations and Names: Where reference standards, specifications, codes, manuals, Laws or Regulations, or other published data of international, national, regional or local organizations are referred to in the Contract Documents, the organization issuing the standard may be referred to by their acronym or abbreviation only. The following acronyms or abbreviations that may appear in the Contract Documents shall have the meanings indicated below. Listing is alphabetical by acronym.

AA	Aluminum Association
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ACS	American Chemical Society
ADSC-IAFD	International Association of Foundation Drilling.
AEIC	Association of Edison Illuminating Companies
AF&PA	American Forest and Paper Association
ABMA	American Bearing Manufacturers Association (formerly Anti-Friction Bearing Manufacturers Association (AFBMA))
AGMA	American Gear Manufacturers Association
AI	Asphalt Institute
AIA	American Institute of Architects
AIChE	American Institute of Chemical Engineers
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ALSC	American Lumber Standards Committee
AMA	Acoustical Materials Association
AMCA	Air Movement and Control Association
AMP	National Association of Architectural Metal Manufacturers, Architectural Metal Products Division
ANSI	American National Standards Institute
APA	The Engineered Wood Association
APHA	American Public Health Association
API	American Petroleum Institute
AREA	American Railway Engineering Association
ARI	Air Conditioning and Refrigeration Institute

ASAE	American Society of Agricultural Engineers
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASNT	American Society for Non-Destructive Testing
ASQ	American Society for Quality
ASSE	American Society of Safety Engineers
ASTM	American Society for Testing and Materials
AWCI	Association of the Wall and Ceiling Industry
AWI	Architectural Woodwork Institute
AWPA	American Wood Protection Association
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
BAAQMD	Bay Area Air Quality Management District
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Industry Association
CBMA	Certified Ballast Manufacturers Association
CDA	Copper Development Association
CEMA	Conveyor Equipment Manufacturers Association
CGA	Compressed Gas Association
CISCA	Ceilings and Interior Systems Construction Association
CISPI	Cast Iron Soil Pipe Institute
CLFMI	Chain Link Fence Manufacturers Institute
CMAA	Crane Manufacturers Association of America
CRSI	Concrete Reinforcing Steel Institute
CSI	Construction Specifications Institute
DIN	Deutsches Institut fur Normung eV (German Institute for Standardization)
DIPRA	Ductile Iron Pipe Research Association
EJCDC	Engineers Joint Contract Documents Committee
EJMA	Expansion Joint Manufacturers Association, Inc.
ETL	Intertek Testing Services, Inc. (formerly ETL Testing Laboratories, Inc.)
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FM	Factory Mutual (FM Global)

FRPI	Fiberglass Reinforced Plastics Institute
FS	Federal Specification
GA	Gypsum Association
GANA	Glass Association of North America
HEW	United States Department of Health, Education and Welfare
HI	Hydraulic Institute
HMI	Hoist Manufacturers Institute
HUD	United States Department of Housing and Urban Development
IBC	International Building Code
ICC	International Code Council
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronics Engineers
IESNA	Illuminating Engineering Society of North America
IFI	Industrial Fasteners Institute
IRI	Industrial Risk Insurers
ISA	Instrumentation, Systems, and Automation Society (formerly Instrument Society of America)
ISO	Insurance Services Office
ISO	International Organization for Standardization
LPI	Lightning Protection Institute
MIA	Marble Institute of America
ML/SFA	Metal Lath/Steel Framing Association
MS	Military Specifications
MSS	Manufacturers' Standardization Society
MMA	Monorail Manufacturers Association
NAAMM	National Association of Architectural Metal Manufacturers
NACE	National Association of Corrosion Engineers
NAPF	National Association of Pipe Fabricators, Inc.
NARUC	National Association of Regulatory Utilities Commissioners
NBHA	National Builders Hardware Association
NBS	United States Department of Commerce, National Bureau of Standards
NCMA	National Concrete Masonry Association
NEC	National Electric Code
NELMA	Northeastern Lumber Manufacturers' Association
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
NETA	International Electrical Testing Association

NFPA	National Fire Protection Association
NFRC	National Fenestration Rating Council
NGA	National Glass Association
NHLA	National Hardwood Lumber Association
NHPMA	Northern Hardwood and Pine Manufacturers Association
NIST	United States Department of Commerce, National Institute of Standards and Technology
NLGA	National Lumber Grades Authority
NRCA	National Roofing Contractors Association
NRMCA	National Ready Mixed Concrete Association
NSF	National Sanitation Foundation
NSSGA	National Stone, Sand, and Gravel Association
NTMA	National Terrazzo and Mosaic Association
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
PCI	Precast/Prestressed Concrete Institute
PEI	Porcelain Enamel Institute
PFI	Pipe Fabrication Institute
PPI	Plastics Pipe Institute
PGMC	Primary Glass Manufacturers Council
PS	Product Standards Section, United States Department of Commerce
RCSC	Research Council on Structural Connections (part of AISC)
RMA	Rubber Manufacturers Association
SAE	Society of Automotive Engineers
SCAQMD	Southern California Air Quality Management District
SCPRF	Structural Clay Products Research Foundation
SCTE	Society of Cable Telecommunications Engineers
SDI	Steel Deck Institute
SDI	Steel Door Institute
SIGMA	Sealed Insulating Glass Manufacturing Association
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractor's National Association
SPI	Society of the Plastics Industry
SPIB	Southern Pine Inspection Bureau
SSPC	Society for Protective Coatings
SWI	Steel Window Institute
TCNA	Tile Council of North America

TEMA	Tubular Exchanger Manufacturers Association
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance
UL	Underwriters Laboratories, Inc.
USAB	United States Access Board
USDOE	United States Department of Energy
USEPA	United States Environmental Protection Agency
USGBC	United States Green Building Council
USGS	United States Geological Survey
USPHS	United States Public Health Service
WCLIB	West Coast Lumber Inspection Bureau
WCMA	Window Covering Manufacturers Association
WCMA	Wood Component Manufacturers Association
WDMA	Window and Door Manufacturers Association
WEF	Water Environment Federation
WWEMA	Water and Wastewater Equipment Manufacturers Association
WWPA	Western Wood Products Association

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 45 29.13

TESTING LABORATORY SERVICES FURNISHED BY CONTRACTOR

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall employ and pay for services of independent testing laboratory to perform specified services.
   2. Inspection, sampling, and testing shall be as specified in the Specifications including but not limited to:
      a. Section 01 45 33, Code-Required Special Inspections and Procedures.
      b. Section 03 00 05, Concrete.
      c. Section 05 05 33, Anchor Systems.
      d. Section 09 91 00, Painting.
      e. Section 13 24 73, Metal Building Systems.
      f. Section 33 05 05, Buried Piping Installation.
      g. Section 40 05 05, Exposed Piping Installation.
      h. Section 46 61 22, GAC Contactor System Installation.
      i. Other tests indicated in the Contract Documents that are not specifically assigned to others.
   3. CONTRACTOR shall pay for:
      a. Tests not specifically indicated in the Contract Documents as being DEPARTMENT's responsibility.
      b. Tests made for CONTRACTOR's convenience.
      c. Repeat tests required because of CONTRACTOR's negligence or defective Work, and retesting after failure of test for the same item to comply with the Contract Documents.
   4. Testing laboratory is not authorized to approve or accept any portion of the Work or defective Work; rescind, alter, or augment requirements of Contract Documents; and perform duties of CONTRACTOR.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ASTM E329, Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
   2. ISO/IEC 17025, General Requirements for the Competence of Testing and Calibration Laboratories.
   3. NIST SRM, Standard Reference Materials.
   4. Standard Methods for the Examination of Water and Wastewater, 22nd Edition.
   5. United States Environmental Protection Agency (US EPA) Standard Methods.
   6. New York State Environmental Laboratory Approval Program (ELAP).

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Testing Laboratory, except for Drinking Water Analysis:
      a. Comply with applicable requirements of ASTM E329.
      b. Testing laboratory shall be licensed to operate in the same jurisdiction as the Site. Where applicable, laboratory shall be certified by the authority having jurisdiction for the types of testing required.
      c. Testing equipment used by laboratory shall be calibrated at intervals of not more than twelve months by devices of accuracy traceable to one of the following: NIST SRM, ISO/IEC 17025, certified by state or local bureau of weights and measures, or values of natural physical constants generally accepted in the engineering and scientific community.
   2. Testing Laboratory, for Drinking Water Analysis:
      a. Laboratory must be certified by the New York State Environmental Laboratory Approval Program (ELAP).
      b. Testing requirements must comply with the requirements of New York State Part V for drinking water based on US EPA Standard Methods.

1.4 SUBMITTALS

A. Informational Submittals: Submit the following:
   1. Quality Control Submittals and Test Reports: Testing laboratory shall promptly submit to CONTRACTOR results of testing and inspections, including:
      a. Date issued.
      b. Project title, number, and name of the Site.
      c. Testing laboratory name and address.
      d. Name and signature of inspector or person obtaining samples.
      e. Date of inspection or sampling.
      f. Record of temperature and weather conditions.
      g. Date of test.
      h. Identification of material or item tested, and associated Specifications Section.
      i. Location in the Project.
      j. Type of inspection or test.
      k. Results of tests and observations regarding compliance with the Contract Documents.
   2. Qualifications Statements:
      a. Testing Laboratory:
         1) Qualifications statement indicating experience and facilities for tests required under the Contract Documents.
         2) Copy of report of inspection of facilities during most recent NIST inspection tour. Include memorandum of remedies of deficiencies reported during inspection.
         3) Copy of certificate of calibration for each instrument or measuring device proposed for use, by accredited calibration agency.

1.5 TESTING LABORATORY DUTIES

A. Testing laboratory shall:
   1. Cooperate with CONTRACTOR and provide qualified personnel promptly on notice.
   2. Perform required inspections, sampling, and testing of materials and methods of construction; comply with applicable reference standards and the Contract Documents; and ascertain compliance with requirements of the Contract Documents.
   3. Promptly notify ENGINEER and CONTRACTOR of irregularities or deficiencies in the Work that are observed during performance of services.
   4. Promptly submit to CONTRACTOR reports of inspections and tests.
   5. Perform additional tests and services, as required by CONTRACTOR.

1.6 CONTRACTOR'S RESPONSIBILITIES

A. CONTRACTOR shall:
   1. Cooperate with testing laboratory personnel.
   2. Provide to testing laboratory preliminary representative samples of materials and items to be tested, in required quantities.
   3. Promptly submit to ENGINEER results of tests and inspections received from testing laboratory.
   4. Furnish to laboratory the preliminary design mix proposed for concrete and other material mixes to be tested by testing laboratory.
   5. Provide labor and facilities:
      a. For access to the Work to be tested, and where required, to Suppliers' operations.
      b. For obtaining and handling samples at the Site.
      c. For facilitating inspections and tests.
      d. For testing laboratory's exclusive use for storing and curing of test samples.
      e. Forms for preparing concrete test beams and cylinders.
   6. Notify laboratory and ENGINEER sufficiently in advance of operations to allow assignment of personnel and scheduling of tests.
   7. Arrange with laboratory and pay for additional services, sampling, and testing required for CONTRACTOR's convenience.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

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SECTION 01 45 33

CODE-REQUIRED SPECIAL INSPECTIONS AND PROCEDURES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope
   1. CONTRACTOR shall provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to perform testing and inspections and cooperate with the Coordinating Special Inspector employed by DEPARTMENT. CONTRACTOR shall engage the services of individual special inspectors and testing agencies for Special Inspections.
   2. Supplement A, Statement of Special Inspections, included with this Section, lists testing and inspections required.
   3. Requirements for vibration, seismic, and wind controls for non-structural components are in Section 40 05 96, Vibration, Seismic, and Wind Controls.

B. Related Sections:
   1. Section 40 05 96, Vibration, Seismic, and Wind Controls.

1.2 DEFINITIONS

A. Coordinating Special Inspector: Professional engineer or architect, hired by DEPARTMENT, registered in the same state as the Site, responsible for coordinating and verifying the inspection and testing required by the Statement of Special Inspections included in this Section and reporting to the Building Official.

B. Building Official: Officer or other designated authority having jurisdiction charged with the administration and enforcement of the governing building code, or a duly authorized representative.

C. Special Inspections: Testing and inspection required in Supplement A, Statement of Special Inspections, of this Section.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. DEPARTMENT will employ and pay for services of the Coordinating Special Inspector, who will have not less than five years of experience in managing, monitoring, and inspecting building construction.
   2. Inspectors shall be qualified in their assigned Special Inspection in accordance with Supplement A, Statement of Special Inspections, of this Section.

B. Regulatory Requirements:
   1. Special Inspections shall be in accordance with applicable building code and other Laws and Regulations, and Supplement A, Statement of Special Inspections, of this Section.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Samples: Representative Samples of materials when required by ENGINEER.

B. Informational Submittals: Submit the following:
   1. Completed Supplement C, Contractor's Statement of Responsibility, as attached to this Section, addressing each system and component listed in the Quality Assurance Plan portion of Supplement A, Statement of Special Inspections, of this Section.
   2. Completed Supplement D, Fabricator's Certificate of Compliance, as attached to this Section, for fabrication of structural steel.
   3. Site Quality Control Submittals: Material test reports.
   4. Procedure Submittals: List of control procedures within CONTRACTOR's organization for testing, including methods, frequency of reporting, and distribution of testing reports.
   5. Qualifications Statements:
      a. Names and qualifications of each testing agency to be employed, and qualifications of testing agency's personnel that will perform testing as required in Supplement A, Statement of Special Inspections, of this Section.
      b. Names and qualifications of each inspector to be employed, and the inspections for which each is responsible, in accordance with Supplement A, Statement of Special Inspections, of this Section.

1.5 CONTRACTOR'S RESPONSIBILITIES

A. Prepare Supplement C, Contractor's Statement of Responsibility, of this Section which shall include:
   1. Acknowledgment of the requirements of the Quality Assurance Plan portion of Supplement A, Statement of Special Inspections, of this Section.
   2. Acknowledgment that necessary quality control shall be exercised in fabricating, handling, and installing to comply with the Contract Documents.
   3. List CONTRACTOR's procedures for ensuring the quality of Work necessary for compliance with the Contract Documents relative to each system or component listed in the Quality Assurance Plan portion of Supplement A of this Section.
   4. List personnel who control the quality of the Work relative to the Contract Documents and indicate their position in the CONTRACTOR's organization.

B. Employ testing and inspection agencies that comply with the requirements of Supplement A, Statement of Special Inspections, of this Section.

C. Provide safe access to the Work to be tested and inspected.

D. Obtain and handle test samples at the Site.

E. Facilitate inspections and tests.

F. Provide access to Suppliers' and Subcontractors' operations as required.

G. Notify testing and inspection agencies, Coordinating Special Inspector, and ENGINEER sufficiently in advance of operations to allow for coordination of personnel at the Site. Do not cover the Work to be inspected until inspection has been completed and results thereof are acceptable.

H. Special Inspections required in this Section do not supersede or make unnecessary inspections and tests required under other Specification Sections or standard inspections required by Laws and Regulations.

1.6 COORDINATING SPECIAL INSPECTOR'S RESPONSIBILITIES

A. Coordinating Special Inspector will:
   1. Review testing and inspection agencies and their personnel submitted by CONTRACTOR, relative to compliance with Supplement A, Statement of Special Inspections, of this Section and in accordance with Laws and Regulations.
   2. Complete Supplement A, Statement of Special Inspections, of this Section to provide names of each inspector and testing agency for each Special Inspection required. Provide Supplement A, Statement of Special Inspections, of this Section to the Building Official, DEPARTMENT, CITY, ENGINEER, and CONTRACTOR.
   3. Coordinate activities of individual inspectors and testing agencies with CONTRACTOR.
   4. Provide interim reports of inspections and material testing to Building Official, DEPARTMENT, CITY, ENGINEER, and ENGINEER's consultants, including structural engineer and architect.
   5. To obtain certificate of use and occupancy from the Building Official, complete and provide to the Building Official, DEPARTMENT, CITY, and ENGINEER Supplement B, Final Report of Special Inspections, of this Section, documenting completion of Special Inspections and correction of discrepancies noted in the Special Inspections.
   6. ENGINEER will be designated as the Coordinating Special Inspector.

1.7 INSPECTOR RESPONSIBILITIES

A. Perform specified inspections, sampling, and testing of materials and methods of construction; review and ascertain compliance with Laws and Regulations.

B. Promptly notify Coordinating Special Inspector, OWNER, ENGINEER and CONTRACTOR of irregularities or deficiencies in the Work observed during Special Inspections. Corrective action, if required, will be determined by ENGINEER.

C. Promptly submit two copies of each report of inspections and tests to Coordinating Special Inspector, ENGINEER, and CONTRACTOR including:
   1. Date issued.
   2. Project title and number.
   3. Name and signature of inspector.
   4. Date of inspection or sampling and test.
   5. Record of temperature and weather.
   6. Identification of product and Specification Section.
   7. Location in Project.
   8. Type of inspection or test.
   9. Results of inspections and tests, and observations regarding compliance with Laws and Regulations, and standards.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 SUPPLEMENTS

A. The supplements listed below, following the "End of Section" designation, are part of this Section:
   1. Supplement A – Statement of Special Inspections
   2. Supplement B – Final Report of Special Inspections
   3. Supplement C – Contractor's Statement of Responsibility
   4. Supplement D – Fabricator's Certificate of Compliance

+ + END OF SECTION + +

Supplement A - Statement of Special Inspections

Project:

Location:

Owner:

Design Professional in Responsible Charge:

This *Statement of Special Inspections* is submitted as a condition for permit issuance in accordance with the Special Inspection and Structural Testing requirements of the Building Code. It includes a schedule of Special Inspection services applicable to the Project as well as the name of the Coordinating Special Inspector and the identity of other approved agencies to be retained for conducting these inspections and tests. This *Statement of Special Inspections* encompass the following disciplines:

☐ Structural ☐ Mechanical/Electrical
☐ Architectural ☐ Other: _____

The Coordinating Special Inspector shall keep records of all inspections and shall furnish inspection reports to the Building Official and the Registered Design Professional in Responsible Charge. Discovered discrepancies shall be brought to the immediate attention of the Contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the Registered Design Professional in Responsible Charge. The Special Inspection program does not relieve the Contractor of his or her responsibilities.

Inspections listed are periodic unless indicated to be continuous or required by code to be continuous.

Interim reports shall be submitted to the Building Official and the Registered Design Professional in Responsible Charge.

A *Final Report of Special Inspections* documenting completion of all required Special Inspections, testing and correction of any discrepancies noted in the inspections shall be submitted prior to issuance of a Certificate of Use and Occupancy.

Job site safety and means and methods of construction are solely the responsibility of the Contractor.

Interim Report Frequency: Weekly or ☐ per attached schedule.

Prepared by:

_____
(type or print name)

_____
Signature Date

Design Professional Seal

Owner's Authorization:

_____
Signature Date

Building Official's Acceptance:

_____
Signature Date

Schedule of Inspection and Testing Agencies

This Statement of Special Inspections / Quality Assurance Plan includes the following building systems:

- ☐ Soils and Foundations
- ☐ Cast-in-Place Concrete
- ☐ Precast Concrete
- ☐ Masonry
- ☐ Structural Steel
- ☐ Cold-Formed Steel Framing
- ☐ Spray Fire Resistant Material
- ☐ Wood Construction
- ☐ Exterior Insulation and Finish System
- ☐ Mechanical & Electrical Systems
- ☐ Architectural Systems
- ☐ Special Cases

Special Inspection Agencies	**Firm**	**Address, Telephone, e-mail**
1. **Coordinating Special Inspector**		
2. Inspector		
3. Inspector		
4. Testing Agency		
5. Testing Agency		
6. Other		

Note: The Coordinating Special Inspector will be engaged by Owner or Owner's Agent, and not by Contractor or Subcontractor whose Work is to be inspected or tested. Inspectors and testing agencies shall be engaged and paid for by Contractor. Conflicts of interest must be disclosed to the Building Official prior to commencing the Work.

Quality Assurance Plan

Quality Assurance for Seismic Resistance

Seismic Design Category

Quality Assurance Plan Required (Y/N)

Description of seismic force resisting system and designated seismic systems:

- Ordinary concentric braced steel frames transferring lateral load to ordinary reinforced concrete shear walls.

Quality Assurance for Wind Requirements

Basic Wind Speed (three-second gust)

Wind Exposure Category

Quality Assurance Plan Required (Y/N)

Description of wind force resisting system and designated wind resisting components:

- Ordinary concentric braced steel frames transferring lateral load to ordinary reinforced concrete shear walls.

Statement of Responsibility

Each contractor responsible for the construction or fabrication of a system or component designated above must submit a Statement of Responsibility.

Qualifications of Inspectors and Testing Technicians

The qualifications of all personnel performing Special Inspections are subject to the approval of the Building Official. The credentials of all inspectors and testing technicians shall be provided if requested.

Key for Minimum Qualifications of Inspection Agents:

When Engineer deems it appropriate that the individual performing a stipulated test or inspection have a specific certification or license as indicated below, such designation shall appear below the *Agency Number* on the Schedule.

PE/SE	Structural Engineer – a licensed SE or PE specializing in the design of building structures
PE/GE	Geotechnical Engineer – a licensed PE specializing in soil mechanics and foundations
EIT	Engineer-In-Training – a graduate engineer who has passed the Fundamentals of Engineering examination

American Concrete Institute (ACI) Certification

ACI-CFTT	Concrete Field Testing Technician – Grade 1
ACI-CCI	Concrete Construction Inspector
ACI-LTT	Laboratory Testing Technician – Grade 1&2
ACI-STT	Strength Testing Technician

American Welding Society (AWS) Certification

AWS-CWI	Certified Welding Inspector
AWS/AISC-SSI	Certified Structural Steel Inspector

American Society of Non-Destructive Testing (ASNT) Certification

ASNT	Non-Destructive Testing Technician – Level II or III.

International Code Council (ICC) Certification

ICC-SMSI	Structural Masonry Special Inspector
ICC-SWSI	Structural Steel and Welding Special Inspector
ICC-SFSI	Spray-Applied Fireproofing Special Inspector
ICC-PCSI	Prestressed Concrete Special Inspector
ICC-RCSI	Reinforced Concrete Special Inspector

National Institute for Certification in Engineering Technologies (NICET)

NICET-CT	Concrete Technician – Levels I, II, III & IV
NICET-ST	Soils Technician - Levels I, II, III & IV
NICET-GET	Geotechnical Engineering Technician - Levels I, II, III & IV

Exterior Design Institute (EDI) Certification

EDI-EIFS	EIFS Third Party Inspector

Other

_____ _____

Soils and Foundations

Item	Agency # (Qualif.)	Scope
1. Excavations	*PE/GE*	*Verify excavations are extended to proper depth and have reached proper material (periodic).*
2. Shallow Foundations	*PE/GE*	*Inspect subgrade below footings for adequate bearing capacity and consistency with geotechnical report (periodic).* *Inspect removal of unsuitable material and preparation of subgrade prior to placement of controlled fill*
3. Compacted Fill	*PE/GE*	*Perform classification and testing of compacted fill materials (periodic).* *Verify use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill (continuous).* *Prior to placement of compacted fill, observe subgrade and verify that site has been prepared properly (periodic).* *Verify extent and slope of fill placement.*
6. Other:		

Cast-in-Place Concrete

Item	Agency # (Qualif.)	Scope
1. Mix Design	*ACI-CCI ICC-RCSI*	*Review concrete batch tickets and verify compliance with approved mix design. Verify that water added at the site does not exceed that allowed by the mix design.*
2. Material Certification	*PE/SE*	*Review trial batch or supporting test data to verify mix meets specified requirements. Confirm materials meet specified requirements.*
3. Reinforcement Installation	*ACI-CCI ICC-RCSI*	*Inspect size, spacing, cover, positioning and grade of reinforcing steel. Verify that reinforcing bars are free of form oil or other deleterious materials. Inspect bar laps and mechanical splices. Verify that bars are adequately tied and supported on chairs or bolsters*
4. Formwork Geometry		*Inspect formwork for proper materials, dimensions and alignment.*
5. Welding of Reinforcing	*AWS-CWI*	*Visually inspect all reinforcing steel welds. Verify weldability of reinforcing steel. Inspect preheating of steel when required.*
6. Anchor Rods	*ACI-CCI ICC-RCSI*	*Inspect size, positioning and embedment of anchor rods. Inspect concrete placement and consolidation around anchors. (continuous)*
7. Concrete Placement	*ACI-CCI ICC-RCSI*	*Inspect placement of concrete. Verify that concrete conveyance and depositing avoids segregation or contamination. Verify that concrete is properly consolidated. (continuous)*
8. Sampling and Testing of Concrete	*ACI-CFTT ACI-STT*	*Test concrete compressive strength (ASTM C31 & C39), slump (ASTM C143), air-content (ASTM C231) and temperature (ASTM C1064).*
9. Curing and Protection	*ACI-CCI ICC-RCSI*	*Inspect curing, cold weather protection and hot weather protection procedures.*
10. Other:		

Masonry

Required Inspection Level: ☐ **1** **X 2**

Item	Agency # (Qualif.)	Scope
1. Material Certification	*PE/SE*	• *Confirm size and strength of masonry units.* • *Confirm grout mix design and materials.* • *Confirm mortar mix design and materials*
2. Mixing of Mortar and Grout	*ICC-SMSI*	*Inspect proportioning, mixing and retempering of mortar and grout. (continuous)*
3. Installation of Masonry	*ICC-SMSI*	*Inspect size, layout, bonding and placement of masonry units.*
4. Mortar Joints	*ICC-SMSI*	*Inspect construction of mortar joints including tooling and filling of head joints.*
5. Reinforcement Installation	*ICC-SMSI* *AWS-CWI*	• *Inspect placement, positioning and lapping of reinforcing steel.* • *Inspect welding of reinforcing steel. (continuous)*
6. Grouting Operations	*ICC-SMSI*	• *Inspect that masonry cells are clear of debris prior to grouting.* • *Inspect placement and consolidation of grout. (continuous)*
7. Weather Protection	*ICC-SMSI*	*Inspect cold weather protection and hot weather protection procedures. Verify that wall cavities are protected against precipitation.*
8. Evaluation of Masonry Strength	*ICC-SMSI*	*Test compressive strength of mortar and grout cube samples (ASTM C780).*
9. Anchors and Ties	*ICC-SMSI*	*Inspect size, location, spacing and embedment of dowels, anchors and ties.*
10. Other:		

Structural Steel

Item	Agency # (Qualif.)	Scope
1. Fabricator Certification/ Quality Control Procedures ☐ Fabricator Exempt	*PE/SE* *AWS/AISC-SSI ICC-SWSI*	• *Verify fabricator has certification from AISC for conventional buildings of the AISC Quality Certification Program and has approval by the Building Official.* • *Review fabricator's certificate of compliance.*
2. Material Certification	*AWS/AISC-SSI ICC-SWSI*	*Review certified mill test reports and identification markings on wide-flange shapes, high-strength bolts, nuts and welding electrodes*
3. Bolting	*AWS/AISC-SSI ICC-SWSI*	*Inspect installation and tightening of high-strength bolts. Verify that splines have separated from tension control bolts. Verify proper tightening sequence. Continuous inspection of bolts in slip-critical connections.*
4. Welding	*AWS-CWI* *ASNT*	• *Visually inspect all welds. Inspect pre-heat, post-heat and surface preparation between passes. Verify size and length of fillet welds. (continuous for all field welds)* • *Ultrasonic testing of all partial and full-penetration welds.*
5. Shear Connectors	*AWS/AISC-SSI ICC-SWSI*	*Inspect size, number, positioning and welding of shear connectors. Inspect suds for full 360 degree flash. Ring test all shear connectors with a 3 lb hammer. Bend test all questionable studs to 15 degrees.*
6. Structural Details	*PE/SE*	*Inspect steel frame for compliance with structural drawings, including bracing, member configuration and connection details.*
7. Metal Deck	*PE/SE* *AWS-CWI*	• *Review manufacturer's certificate of compliance with ASTM standards specified. Verify decking section profile, gage, and properties conform to contract documents.* • *Inspect welding and side-lap fastening of metal roof and floor deck.*
8. Other:		

Item	Agency # (Qualif.)	Scope
1. Material Certification	*PE/SE*	• *Confirm anchor type (including product name), anchor dimensions, and anchor material grade for each anchor application.* • *Confirm post-installed anchor compliance with specified requirements and suitability for each application type by review of the anchor system ICC-ES Evaluation Service Report.* • *For adhesive anchors, confirm adhesive type*
2. Installation of Adhesive Anchors for Concrete, Grout-filled Masonry, and Hollow Concrete Masonry	ICC-RCSI ICC-SMSI	• *Review compliance with the installation requirements of the anchor system ICC Evaluation Service Report.* • *Verify and record anchor type (including product name), anchor dimensions, anchor material grade, adhesive type, adhesive expiration date, concrete or masonry type, base material compressive strength, drill bit type, hole dimensions, hole cleaning procedures, anchor spacing, edge distances, base material thickness, anchor embedment, curing period prior to tightening, and tightening torque.* • *Inspect installation of each type and size of adhesive anchor by construction personnel on the site. (continuous)*
3. Installation of Concrete and Grout-filled Masonry Wedge Expansion Anchors	ICC-RCSI ICC-SMSI	• *Review compliance with the installation requirements of the anchor system ICC Evaluation Service Report.* • *Verify and record anchor type (including product name), anchor dimensions, anchor material grade, concrete or masonry type, base material compressive strength, drill bit type, hole dimensions, hole cleaning procedures, anchor spacing, edge distances, base material thickness, anchor embedment and tightening torque.* • *Inspect installation of each type and size of wedge anchor by construction personnel on the site. (continuous)*
4. Anchor Testing	ASNT	• *Perform tension pullout test on 10 percent of each post-installed anchor type and size.*

Wood Construction

Item	Agency # (Qualif.)	Scope
1. Fabricator Certification/ Quality Control Procedures ☐ Fabricator Exempt	*PE/SE*	• *For pre-fabricated wood structural elements and assemblies, verify that the fabricator maintains detailed fabrication and quality control procedures that provide a basis for inspection control of the workmanship and the fabricator's ability to conform to the Contract Documents and approved and accepted submittals. The special inspection shall review the procedures for completeness and adequacy relative to the requirements of codes and Laws and Regulations for the fabricator's scope of the Work.* • *If exempt, review fabricator's certification for fabrication by an approved special inspection agency and certificate of compliance stating that the Work was performed in accordance with the Contract Documents and approved or accepted submittals.*
2. Diaphragms	*PE/SE*	• *Review grade and thickness of wood structural panel sheathing to verify conformance with the Contract Documents.* • *Verify nominal size of framing members at adjoining panel edges, the nail or staple diameter and length, the number of fastener lines and that the spacing between fasteners in each line and at edge margins agrees with the Contract Documents.*
3. Other:		

Mechanical & Electrical Systems

Item	Agency # (Qualif.)	Scope
1. Piping containing combustible or hazardous materials or piping where failure could damage the fire sprinkler system or other piping or equipment containing combustible or hazardous materials		• *Inspection of piping installation including vertical and lateral supports.* • *Inspection of post-installed concrete anchors for pipe, 3" and larger(continuous)*
2. Mechanical and process equipment containing combustible or hazardous materials		• *Review of manufacturer's certification that the equipment can resist the indicated seismic forces per the code without discharge of hazardous material.* • *Inspection of equipment installation and anchorage. (continuous for post-installed concrete anchors)*
3. Mechanical and electrical system components located where support failure could damage piping or equipment containing combustible and/or hazardous materials or the fire sprinkler system.		*Inspection of mechanical and electrical component installation including vertical and lateral supports.*
4. Tanks containing hazardous materials.		• *Review of manufacturer's certification that the tank and anchorage can resist the indicated seismic forces per the code without discharge of hazardous material.* • *Inspection of tank installation and anchorage. (continuous for post-installed concrete anchors)*

Architectural Systems

Item	Agency # (Qualif.)	Scope
1. Suspended Ceilings		*Inspection of suspended ceiling and associated lighting fixture installation including vertical and lateral supports.*
2.		
3.		
4.		

Special Cases

Item	Agency # (Qualif.)	Scope
1. Contractor statement of responsibility for structural seismic system construction		*Review statement of responsibility for:* • *Awareness of requirements and control needed to meet seismic requirements.* • *Procedures for exercising control and reporting on quality control* • *Identification and qualifications of person(s) in contractor's organization responsible for quality assurance for seismic system construction.*
2. Contractor statement of responsibility for seismic system installation of piping containing combustible or hazardous materials or piping where failure could damage the fire sprinkler system or other piping or equipment containing combustible or hazardous materials		*Review statement of responsibility for:* • *Awareness of requirements and control needed to meet seismic requirements.* • *Procedures for exercising control and reporting on quality control* • *Identification and qualifications of person(s) in contractor's organization responsible for quality assurance for seismic system construction.*
3. Contractor statement of responsibility for seismic system installation of mechanical and process equipment containing combustible or hazardous materials		*Review statement of responsibility for:* • *Awareness of requirements and control needed to meet seismic requirements.* • *Procedures for exercising control and reporting on quality control* • *Identification and qualifications of person(s) in contractor's organization responsible for quality assurance for seismic system construction.*
4. Contractor statement of responsibility for seismic system installation of mechanical and electrical system components located where support failure could damage piping or equipment containing hazardous materials or the fire sprinkler system.		*Review statement of responsibility for:* • *Awareness of requirements and control needed to meet seismic requirements.* • *Procedures for exercising control and reporting on quality control* • *Identification and qualifications of person(s) in contractor's organization responsible for quality assurance for seismic system construction.*
5. Contractor statement of responsibility for seismic system installation of tanks containing hazardous materials.		*Review statement of responsibility for:* • *Awareness of requirements and control needed to meet seismic requirements.* • *Procedures for exercising control and reporting on quality control* • *Identification and qualifications of person(s) in contractor's organization responsible for quality assurance for seismic system construction.*

Supplement B - Final Report of Special Inspections

Project:

Location:

Owner:

Owner's Address:

Architect of Record:

Structural Engineer of Record:

To the best of my information, knowledge and belief, the Special Inspections required for this project, and itemized in the *Statement of Special Inspections* submitted for permit, have been performed and all discovered discrepancies have been reported and resolved other than the following:

Comments:

(Attach continuation sheets if required to complete the description of corrections.)

Interim reports submitted prior to this final report form a basis for and are to be considered an integral part of this final report.

Respectfully submitted,
Special Inspector

(Type or print name)

Signature Date

Licensed Professional Seal

Agent's Final Report

Project:

Agent:

Special Inspector:

To the best of my information, knowledge and belief, the Special Inspections or testing required for this project, and designated for this Agent in the *Statement of Special Inspections* submitted for permit, have been performed and all discovered discrepancies have been reported and resolved other than the following:

Comments:

(Attach continuation sheets if required to complete the description of corrections.)

Interim reports submitted prior to this final report form a basis for and are to be considered an integral part of this final report.

Respectfully submitted,
Agent of the Special Inspector

(Type or print name)

Signature Date

Licensed Professional Seal or Certification

Supplement C - Contractor's Statement of Responsibility

Each contractor responsible for the construction or fabrication of a system or component designated in the Quality Assurance Plan of Supplement A shall submit a Contractor's Statement of Responsibility.

Project:

Contractor's Name:

Address:

License No.:

Description of designated building systems and components included in the Contractor's Statement of Responsibility:

Contractor's Acknowledgment of Special Requirements

I hereby acknowledge that I have received, read, and understand the Project's seismic requirements, Quality Assurance Plan in Supplement A, and Special Inspection program.

I hereby acknowledge that control will be exercised to obtain conformance with the Contract Documents approved by the Building Official having jurisdiction.

_____ _____

Signature Date

Contractor's Provisions for Quality Control

Procedures for exercising control within the Contractor's organization, the method and frequency of reporting and the distribution of reports are attached to this Statement.

Identification and qualifications of the person(s) exercising such control and their position(s) in the organization are attached to this Statement.

Supplement D - Fabricator's Certificate of Compliance

Each approved fabricator that is exempt from Special Inspection of shop fabrication and implementation procedures per section 1704.2 of the International Building Code must submit a *Fabricator's Certificate of Compliance* at the completion of fabrication.

Project:

Fabricator's Name:

Address:

Certification or Approval Agency:

Certification Number:

Date of Last Audit or Approval:

Description of structural members and assemblies that have been fabricated:

I hereby certify that items described above were fabricated in strict accordance with the Contract Documents.

_____ _____
Signature Date

_____
Title

Attach copies of fabricator's certification or building code evaluation service report and fabricator's quality control manual.

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SECTION 01 45 53

CLEANING, TESTING, AND DISINFECTING HYDRAULIC STRUCTURES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes requirements for cleaning, testing, and disinfecting structures filled with fluid, such as tanks and flow conveyance channels. This Section does not cover manholes or utility chambers.
   2. General CONTRACTOR shall provide labor, material, tools, equipment, and incidentals as shown, specified, and required to clean, flush, disinfect, and test structures that will contain fluid.
   3. The Work under this Section also includes providing all labor and materials required to prepare hydraulic structures for testing and disinfecting, conveying water to testing location, performing testing, and all labor and materials required to drain and dispose of water used for testing and disinfecting.

B. Hydraulic Structures Scheduled for Hydrostatic Testing and Disinfection: Clean, test, and disinfect interior surfaces of the following:

Hydraulic Structure Number	Hydraulic Structure Service and Location
1.	Backwash Tank – Hydrostatic Test and Disinfection
2.	Stormwater Tank – Hydrostatic Test
3.	Detection Space – Hydrostatic Test
4.	GAC Contactors - Hydrostatic Test and Disinfection

C. Water for Testing:
   1. Water for initial testing will be furnished by CITY.
   2. CONTRACTOR shall provide temporary piping, hoses, valves, backflow preventers, appurtenances, and services required for testing.
   3. CONTRACTOR shall convey the water to testing location.
   4. Water for testing may be withdrawn from:
      a. Existing fire Hydrant on the Water Plant Site.
   5. Maximum rate at which water may be withdrawn is 200 gpm. CONTRACTOR shall provide on withdrawal piping, downstream of backflow preventer, flow meter and valve to control rate of flow. Flow meter shall be calibrated within the past 12 months. Operation of flow meter shall be confirmed at the Site and witnessed by ENGINEER. Submit to ENGINEER certification of calibration.

6. Cost of water for re-testing shall be paid by CONTRACTOR to DEPARTMENT at standard rates of local water supply utility.

D. Provide chemicals required for disinfection and dechlorination.

E. Not Included Under this Section:
   1. The following are specified under other Specifications Sections:
      a. Cleaning, testing and disinfecting of buried piping is under Section 33 05 05, Buried Piping Installation.
      b. Cleaning, testing and disinfection of exposed piping is under Section 40 05 05, Exposed Piping Installation.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ACI 350.1, Tightness Testing of Environmental Engineering Concrete Structures, and Commentary.
   2. ANSI/AWWA B100, Standard for Granular Filter Material.
   3. ANSI/AWWA C651, Disinfecting Water Mains.
   4. ANSI/AWWA C652, Disinfection of Water-Storage Facilities.
   5. ANSI/AWWA C653, Disinfection of Water Treatment Plants.
   6. APHA/AWWA/WEF, Standard Methods for the Examination of Water and Wastewater.
   7. NSF/ANSI 60, Drinking Water Treatment Chemicals – Health Effects.

1.3 TERMINOLOGY

A. The following words or terms are not defined but, when used in this Section, have the following meaning:
   1. "Hydraulic structures" are tanks, channels, and other structures through which fluid is conveyed or that hold fluid. Hydraulic structures include structures open to the atmosphere and structures with closed tops, and structures that contain both fluid and gas. Hydraulic structures include wet wells, junction chambers, equalization tanks, storage tanks, treatment process tanks such as grit chambers, clarifiers, aeration tanks, filter beds, contact tanks, and other channels and tanks designated in this Section. Excluded are structures that are to be cleaned or tested under other Specifications Sections.

1.4 QUALITY ASSURANCE

A. Qualifications:
   1. Testing Laboratory:
      a. Refer to Section 01 45 29.13, Testing Laboratory Services Furnished by Contractor, for drinking water testing laboratory qualifications requirements.

2. Backflow Preventer Technician:
    a. Backflow prevention technicians shall possess a valid certification as a backflow preventer technical issued by authority having jurisdiction.

B. Regulatory Requirements:
1. Backflow preventers shall be tested by certified backflow prevention technician within 12 months of the date backflow preventer is used on the Project.
2. New York State Department of Health.
3. Orange County Health Department.

1.5 SUBMITTALS

A. Action Submittals: Submit the following:
1. Product Data:
    a. Manufacturer's published data on chemicals used for disinfection and dechlorination.
    b. Evidence of NSF/ANSI 60 compliance for chemicals used in disinfection and dechlorination.
2. Procedure Submittals (including proposed plans for water conveyance, control, and disposal):
    a. Cleaning procedures.
    b. Hydrostatic testing procedures and equipment required, by hydraulic structure to be tested.
    c. Air testing procedures and equipment required, by hydraulic structure to be tested.
    d. Disinfection procedures and equipment required, by hydraulic structure to be tested.

B. Informational Submittals: Submit the following:
1. Certifications:
    a. Certification of each backflow preventer proposed for use.
    b. Calibration certification for each flow meter proposed for use.
    c. Certification by CONTRACTOR and testing laboratory that tests were performed in compliance with referenced standards.
2. Special Procedure Submittals:
    a. Time schedule for each test required.
    b. Procedure for disposal of chlorinated water, including proposed dechlorination chemical and methods proposed for use.
    c. Not less than five days prior to scheduled test, submit written notification of intent to test each hydraulic structure. Do not commence testing without obtaining ENGINEER's acceptance of testing procedures, chemicals to be used, notification, and other required pre-test submittals.
3. Field Quality Control Submittals:
    a. Results of each test.

b. Chain of custody documentation for samples obtained for bacteriological and odor testing.

4. Qualifications Statements:
   a. Testing laboratory qualifications in accordance with Section 01 45 29.13, Testing Laboratory Services Furnished by Contractor, and this Section.
   b. Certified backflow preventer technician, when requested by ENGINEER.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Test Apparatus and Fluid Control Devices:
   1. Provide temporary pumping, hoses, piping, instrumentation, and other materials, equipment, and items necessary to perform cleaning, testing, and disinfecting of hydraulic structures.
   2. Provide and maintain temporary valves, plugs, bulkheads, and other fluid control devices suitable for the intended use and required cleaning, testing, and disinfecting.
   3. Do not use materials or items that will injure or damage the Work.
   4. Temporary backflow preventers shall be reduced pressure zone-type.

B. Chemicals:
   1. Chemicals used for disinfection and dechlorination shall be listed in NSF/ANSI 60.

PART 3 – EXECUTION

3.1 CLEANING

A. Cleaning Requirements:
   1. Prior to testing, remove all scaffolding, planking, tools, rags, dirt, debris, foreign matter, and material not part of the permanent structure.
   2. Thoroughly clean hydraulic structures' walls, floors, and operating equipment by sweeping, high-pressure wash, scrubbing, or other methods that will not injure the Work and existing facilities.
   3. Remove from each hydraulic structure all water, dirt, and foreign material accumulated during cleaning. Provide temporary pumps, piping, and facilities as required to discharge water from the cleaning operation in manner acceptable to ENGINEER and in accordance with Laws and Regulations.
   4. Do not proceed with testing until ENGINEER has accepted in the field results of cleaning.

5. Comply with Section 01 74 05, Cleaning, and this Section.

3.2 TESTING AND DISINFECTION – GENERAL

A. General Provisions Applicable to Cleaning and Testing of All Hydraulic Structures:
   1. Separately test each hydraulic structure.
   2. Hydraulic structures shall be free of visible leakage. Repair leaks in manner in accordance with the Contract Documents.
   3. Interior Coatings and Finishes: Apply and cure protective coatings for concrete before starting disinfection.
   4. Exterior Coatings and Finishes: Successfully test hydraulic structure, and obtain ENGINEER's acceptance of results of hydrostatic and air testing before applying exterior coating materials, such as dampproofing, and before installing masonry block veneer (if any).
   5. Provide disinfection be as late as possible in the execution of the Work to provide maximum degree of sterility at the time the Work is placed into continuous service.
   6. Bacteriological and Odor Testing – General:
      a. Testing shall be performed by certified testing laboratory retained by CONTRACTOR. Testing laboratory shall be acceptable to ENGINEER.
      b. Samples shall be obtained and transported by testing laboratory employee.
      c. Reports of bacteriological testing shall indicate whether results comply with the Contract Documents and shall be acceptable to authorities having jurisdiction.

3.3 HYDROSTATIC TESTING OF HYDRAULIC STRUCTURES

A. Analysis of data from hydrostatic testing of hydraulic structures shall be by CONTRACTOR in accordance with ACI 350.1 and this Section. Provide materials, equipment, and labor to obtain test data.

B. Prior to starting hydrostatic testing, perform the following:
   1. All elements of the hydraulic structure that will resist pressure exerted by retained fluid shall be in place and at specified strength. Concrete shall be fully cured.
   2. Do not backfill structure walls before testing. Refer to Paragraph 3.2.A of this Section regarding application of exterior coatings to hydraulic structures.
   3. Valves, gates, blind flanges, and items other than concrete that control the flow of or otherwise retain fluid in the hydraulic structure shall be watertight for the hydrostatic test.
   4. Repair defective concrete.

5. Advise ENGINEER, CITY and DEPARTMENT prior to commencing filling hydraulic structure for hydrostatic testing. Minimum time between notice and starting to fill for hydrostatic testing shall be in accordance with Paragraph 1.5.B.2 of this Section.
6. Do not perform hydrostatic testing during period when ambient temperature is below 33 degrees F.
7. Hydraulic structures with interior, wetted concrete surfaces shall remain filled with water for an initial adsorption period of not less than 48 hours. Following this initial period, provide make-up water to fill the hydraulic structure to specified water surface test elevation.

C. Required Water Surface Elevation for Hydrostatic Testing:
1. Using the water source specified in this Section, fill hydraulic structures to specified water surface test elevation indicated in the following table:

Hydraulic Structure Number	**Hydraulic Structure Service and Location**	**Water Surface Elevation for Testing**
1	Contact Tank	Up to underside of top slab
2	Stormwater Tank	Up to underside of tank slab
3	Detection Space	Up to underside of tank slab
4	GAC Contractor	Complete volume of system

2. Where test elevation is not specified or indicated and fluid level in the structure will normally be controlled by a weir, fill structure to elevation six inches below the weir crest.
3. Where test elevation is not specified or indicated and structure does not have a flow control weir, test elevation shall be two feet below top of structure.

D. Filling Hydraulic Structures with Water:
1. Fill the portion of the hydraulic structure to be tested at rate that does not exceed two vertical feet per hour.
2. When potable water is used for testing, during filling provide temporary backflow preventer at the point where water is withdrawn from potable water system.

E. When water has reached specified test elevation and specified wetting period has elapsed, inspect hydraulic structure's exposed surfaces for leakage. Before starting hydrostatic testing, repair apparent leakage or weeping.

F. Test Duration: Hydrostatic test duration shall be determined by ENGINEER in accordance with ACI 350.1, and shall not be less than 24 hours.

G. Allowable Leakage:
   1. Leakage during the test period for hydraulic structures with vertical walls is defined as the volume calculated using the difference in water surface elevations at the start and end of the test period adjusted by adding the volume of precipitation and subtracting the volume of evaporation measured during the test period.
   2. Leakage during the test period for hydraulic structures with sloping walls is the quantity of water that must be supplied to the hydraulic structure or section thereof to maintain the water level within three inches of specified water surface test elevation during the hydrostatic test, plus the volume of water required to fill the hydraulic structure to specified water surface test elevation at conclusion of hydrostatic test, plus precipitation, minus evaporation.
   3. For hydraulic structures with interior, wetted concrete surfaces that are not lined, allowable leakage is 0.075 percent of volume tested for each 24-hour period or portion thereof.
   4. For hydraulic structures with interior wetted concrete surfaces lined with waterproof material, allowable leakage is 0.050 percent of volume tested for each 24-hour period or portion thereof.
   5. No leakage is allowed for hydraulic structures with interior, wetted surfaces that do not include concrete.

H. Measurement Locations:
   1. For hydraulic structures or portions thereof (when entire hydraulic structure is not tested as a whole) that are equal to or less than 1,000 square feet in water surface area, measure water level at not less than two locations approximately 180 degrees apart.
   2. For hydraulic structures or portions thereof (when entire hydraulic structure is not tested as a whole) that are greater than 1,000 square feet in water surface area, measure water level at not less than four locations approximately 90 degrees apart.
   3. Each measurement location shall be marked and given distinct reference number. Mark reference point on face of wall above test water surface in manner that will prevent movement or deterioration of reference point mark during the test. Remove reference point mark upon completion of testing and acceptance of testing results by ENGINEER.
   4. Position the measurement locations to minimize effects of wave action and wind.

I. Evaporation and Precipitation Measurement:
   1. Evaporation and Precipitation Measurement Vessels:
      a. In hydraulic structures open to atmosphere, a clear plastic, calibrated, open-topped container not less than 18-inch diameter and not less than 18 inches deep shall be provided at each measurement location.

b. Before starting test, partially fill each evaporation-precipitation measurement vessel and float the vessel in the hydraulic structure, held in position near each measurement location.
c. Calibration increments in container shall be 0.1-inch or less.

2. Position evaporation-precipitation measurement vessels so that vessels are not shaded by hydraulic structure's walls, away from overhead items such as beams, pipes, and walkways.

J. Obtaining Test Measurements:

1. Do not start hydrostatic tests when severe weather conditions, such as heavy precipitation, high winds, major changes in average daily temperature, and other severe conditions are predicted for duration of test period.
2. Record the following measurements at each test location at start of test period and at 12-hour intervals thereafter:
   a. Distance from reference point elevation to actual water surface.
   b. Depth of water in evaporation-precipitation containers.
   c. Temperature of test water at point 18 inches below water surface.
   d. Temperature of water in evaporation-precipitation measurement vessels at mid-depth.
3. If actual water surface in hydraulic structure is subject to wave action at measurement location, record as data the average water surface elevation of wave oscillations.
4. Change in the water surface elevation at each measurement location shall be averaged and adjusted as follows:
   a. Total change in hydraulic structure's water surface elevation shall be adjusted by average change in water surface elevation in evaporation-precipitation measurement vessels.
   b. Where averaged water temperature measurements vary by more than three degrees F from start to completion of test period, adjustment in test volume shall be determined by change of density of water resulting from change in the average water temperature.
5. Determination of Leakage:
   a. Hydraulic Structures with Vertical Walls: Leakage volume shall be the drop in water surface elevation measured during the test, multiplied by water surface area of hydraulic structure tested.
   b. Initial full volume shall include the volume of sloping tank bottoms, sump pits, and other features that contain water that is connected to the hydraulic structure during the hydrostatic test.
   c. Allowable leakage shall be determined by multiplying the initial full volume by the daily leakage allowance and by the leakage test time period in days.

K. Criteria for Acceptance:

1. Hydrostatic test will pass if measured leakage is less than allowable leakage and no leaks or weeping is observed.

2. If test becomes unreliable due to excessive precipitation, freezing, or other external factors, re-start and re-perform the test at no additional cost to DEPARTMENT.
3. If hydrostatic test fails, the hydraulic structure may be re-tested immediately without repairs. If subsequent hydrostatic test fails, repair probable areas of leakage and repeat the hydrostatic test.
4. Re-test hydraulic structure until it meets criteria specified for acceptance. Repair probable leakage areas before testing.

L. Reuse and Disposal of Water Used in Hydrostatic Tests:
1. Obtain ENGINEER's acceptance before water used in one hydrostatic test is pumped to a different hydraulic structure for reuse in subsequent test.
2. If chlorine residual in test water exceeds 0.5 mg/L, dechlorinate water used for hydrostatic testing to remove chlorine residual before discharging water to storm water drainage routes. Dechlorinate water using sodium bisulfite or other dechlorination chemical acceptable to ENGINEER.

M. Hydraulic structure shall not be backfilled or have exterior coating applies (such as dampproofing) until ENGINEER accepts hydrostatic test results.

3.4 TESTING OF APPURTENANT PIPING

A. Test piping connected to hydraulic structures in accordance with the Contract Documents.

3.5 DISINFECTING HYDRAULIC STRUCTURES

A. Method:
1. Hydraulic structures to be disinfected shall be chlorinated by CONTRACTOR in accordance with one of the methods in ANSI/AWWA C653, unless otherwise specified or indicated in the Contract Documents.

C. Disinfection Procedure:
1. Provide temporary taps, plugs, valves, drains, pumps, tanks, piping, facilities, and connections required to disinfect, dechlorinate, and remove chlorinated water in accordance with the Contract Documents.
2. Disinfect hydraulic structures immediately before each structure is placed into operation, to prevent facility from becoming contaminated after disinfection.
3. Use solution of water and liquid chlorine, calcium hypochlorite, or sodium hypochlorite for disinfecting hydraulic structures. Placement of solid chlorine, such as powder or tablets, inside hydraulic structures as means of disinfection is unacceptable.
4. Introduce chlorine solution into hydraulic structure in manner accepted by ENGINEER to obtain a chlorine residual of at least 2.0 mg/L.

5. Add potable water to hydraulic structure with the chlorine solution. Introduce water to hydraulic structure through backflow prevention device.
6. Dechlorination:
    a. When Chlorination Water will be discharged to Potable Water System: Upon completion of disinfection of each hydraulic structure, dechlorinate contents of hydraulic structure until chlorine residual equals the residual in local potable water system.
    b. If residual of local potable water system is not available, dechlorinate to achieve maximum chlorine residual of 0.5 mg/L.
    c. Dechlorination shall be in accordance with ANSI/AWWA C653.
7. Discharge of Chlorinated Water from Hydraulic Structure:
    a. For purposes of this Article, "chlorinated water" means water discharged from the hydraulic structure after disinfection, regardless of whether the water has been dechlorinated.
    b. Discharge of chlorinated water into a sewer will not be allowed without written approval of owner of wastewater conveyance system and wastewater treatment facility.
    c. Do not discharge chlorinated water onto roadways or into ditches, storm sewers, drainage culverts, streams, or wetlands.

D. Bacteriological and Odor Testing:
1. After disinfection is completed and before hydraulic structure is placed in service, test the hydraulic structure for odor and bacteria in accordance with ANSI/AWWA C653 and APHA/AWWA/WEF Standard Methods for Examination of Water and Wastewater.
2. Obtain from each disinfected hydraulic structure samples for bacteriological and odor testing as follows:
    a. Immediately After Completion of Disinfection: Not less than two samples.
    b. Twenty-four Hours after Obtaining First Set of Samples: Not less than two samples.
3. Sampling and testing for bacteriological and odor tests shall comply with Paragraph 3.2.A.6 of this Section. Test results shall indicate satisfactory results for bacteria and odor, in accordance with requirements of authority having jurisdiction, before hydraulic structure will be Substantially Complete.
4. Repeat the disinfection procedure at no additional cost to DEPARTMENT until bacteriological and odor test results are acceptable.

+ + END OF SECTION + +

SECTION 01 51 13

TEMPORARY ELECTRICITY

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. General CONTRACTOR shall provide temporary electrical service during the Project. Provide temporary electrical service through the later of: 1) Substantial Completion of the entire Project, and 2) removal of temporary field offices and sheds.
   2. Cost of electricity used for the Project, including cost of electricity for start-up and testing, shall be paid by General CONTRACTOR.

B. Source:
   1. Electric power for temporary electrical service is available from Central Hudson Gas & Electric.

C. Limits of Temporary Electric Service:
   1. Provide and maintain temporary electric service so that electricity can be obtained at all locations within the Project's work areas using extension cord of not more than 100 feet.
   2. Temporary electric service required beyond limits shown or indicated shall be provided by contractor requiring such power, who shall provide their own portable generator or other means of temporary electric service.
   3. Each contractor using temporary electric service shall provide their own extension cords, drop lights, power tools, other small devices, and distribution system.

D. Allowable working hours are specified in the Supplementary Conditions. If another contractor requires temporary electric service at times other than those indicated in the Contract Documents, other contractor shall promptly notify General CONTRACTOR, who shall provide required service. Contractor requiring additional service shall pay General CONTRACTOR reasonable charge for the additional service.

E. Continuously provide electric power to construction field offices and sheds.

F. Unless existing equipment is specified as being taken temporarily out of service to accommodate portions of the Project, provide temporary electric power to maintain continuous operation of existing facilities during change-over of electrical

equipment. Allowable shutdowns, if any, are indicated in Section 01 14 16, Coordination with City's Operations.

G. Restrictions:
   1. Existing Systems: Modify and extend existing systems for temporary electric service.
   2. Obtain CITY's permission to use electricity from existing systems.
   3. Permanent System provided Under the Project: Obtain CITY's written permission for using permanent electrical system provided under the Project, indicating conditions of use.

PART 2 – PRODUCTS

2.1 TEMPORARY SERVICE REQUIRED

A. Materials and equipment used for temporary electric service may be new or used, and shall be in good, fully serviceable condition. Temporary electric service shall not create unsafe conditions. Comply with Laws and Regulations and requirements of electric utility owner.

B. Size of Temporary Electric Service:
   1. Temporary electric service is required for lighting, power tools, construction field offices and sheds, and similar usages. Electric space heaters, dewatering pumps and equipment, and large welding machines are not included in required temporary electric service.
   2. Temporary electric system shall be 240/120-volt, single-phase, 60 Hertz, with sufficient capacity to provide service for construction use by all trades and with not less than the following facilities:
      a. 200-ampere frame with 200-ampere trip primary circuit breaker.
      b. Two-pole safety switch, and 240/120-volt, single-phase, three-wire distribution panel.

C. Provide not less than one power center on each floor where work will be performed, as required.

D. Provide each electrical outlet with circuit breaker protection and comply with ground fault protection requirements of NEC Article 406, Receptacles, Cord Connectors, and Attachment Plugs, and UL 943, Standard for Ground-Fault Circuit-Interrupters.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install temporary electric service in neat, orderly manner. Temporary electric service shall be structurally and electrically sound throughout.

B. Modify temporary electric service and rearrange wiring as Project progress requires.

C. Locate all temporary electrical facilities to avoid interfering with the work of all trades, hoisting, materials handling, storage, traffic areas, existing operable facilities, and work under other contracts.

D. CONTRACTOR is responsible for and shall return to original condition those portions of permanent electric system used in completing the Work.

3.2 USE

A. Properly supervise use of temporary electric service. Enforce compliance with Laws and Regulations and safe practices, and prevent abuse of services.

3.3 REMOVAL

A. Completely remove materials and equipment associated with temporary electric service when temporary electric service is no longer required.

B. Repair damage caused by temporary electric service and its removal. Restore the Site to condition in accordance with the Contract Documents; if restoration of damaged areas is not specified, restore to preconstruction condition.

+ + END OF SECTION + +

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SECTION 01 51 16

TEMPORARY FIRE PROTECTION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. General CONTRACTOR shall provide temporary fire protection throughout the Project, until CITY takes occupancy. Remove temporary fire protection when CITY takes occupancy.
   2. Pay all costs associated with temporary fire protection, including installation, maintenance, and removal.
   3. All contractors shall comply with this Section and Laws and Regulations regarding temporary fire protection.

1.2 QUALITY ASSURANCE

A. Reference Standards: Standards referenced in this Section are:
   1. NFPA 10, Portable Fire Extinguishers.
   2. NFPA 241, Safeguarding Construction, Alternation, and Demolition Operations.

B. Regulatory Requirements:
   1. Temporary fire protection shall comply with Laws and Regulations and requirements of authorities having jurisdiction.
   2. Coordinate temporary fire protection with requirements of Sectio 01 35 23, Safety Requirements.

PART 2 – PRODUCTS

2.1 REQUIRED TEMPORARY FIREFIGHTING EQUIPMENT

A. Portable Fire Extinguishers:
   1. Provide portable fire extinguishers, rated not less than 2A or 5B in accordance with NFPA 10 for each temporary building or structure, and for every 3,000 square feet of floor area under construction.
   2. Provide a portable fire extinguisher at distance of not greater than 50 feet from all points in each protected area.

PART 3 – EXECUTION

3.1 FIRE PREVENTION AND SAFETY MEASURES

A. Prohibit smoking in areas classified as hazardous and inside of CITY's buildings and structures. Provide visible, suitable warning signs in areas that are continuously or intermittently hazardous. Temporary warning signs shall comply with Laws and Regulations.

B. Storage of Flammable and Combustible Materials:
   1. Use metal safety containers for storing and handling flammable and combustible liquids and materials.
   2. Do not store flammable or combustible liquids and materials in or near stairways or exits.

C. Maintain clear egress from all points at the Site.

D. Comply with NFPA 241.

3.2 USE AND MAINTENANCE

A. General:
   1. Periodically inspect temporary fire protection facilities and replace or renew when necessary.
   2. Instruct employees in the proper use of temporary fire protection devices.
   3. Enforce proper use of fire protection devices.

3.3 REMOVAL

A. Remove temporary fire protection facilities when CITY takes beneficial occupancy of the Work. Ensure that permanent fire protection facilities are properly in place before removing temporary fire protection facilities.

+ + END OF SECTION + +

SECTION 01 51 23

TEMPORARY HEATING, COOLING, VENTILATING, AND ENCLOSURES

PART 1 – GENERAL

1.1 GENERAL

A. Scope:
   1. General CONTRACTOR shall provide temporary heating, cooling, ventilating, and enclosures during the Project. Provide temporary heating, cooling, ventilating, and enclosures through Substantial Completion of the entire Project and removal of temporary field offices and sheds.
   2. Install, maintain, and remove temporary heating, cooling, ventilating, and enclosures.
   3. Cost Responsibility for Fuel and Electricity for Temporary Heating, Cooling, and Ventilating:
      a. Cost of fuel used for temporary heating, cooling, and ventilating, shall be paid by General CONTRACTOR.
      b. Temporary electricity shall be in accordance with Section 01 51 13, Temporary Electricity.
      c. Should CITY occupy part of the Project prior to Substantial Completion, cost of utilities consumed by CITY in using the substantially completed Work via temporary service will be shared proportionately between DEPARTMENT and CONTRACTOR on a basis mutually agreed to by the parties.
   4. Maintain (including cleaning and replenishment) temporary heating, cooling, and ventilating facilities and enclosures, and continuously provide consumables as required.
   5. Temporary utilities and temporary facilities shall be adequate for the Site and Project requirements.
   6. Provide temporary facilities and temporary utilities in compliance with Laws and Regulations and, when applicable, requirements of utility owners.

B. Each prime contractor is responsible for protecting its own work from weather and the elements.

1.2 DEFINITIONS

A. The following terms are defined for use in this Section:
   1. Temporary Enclosure: Preliminary enclosure of a portion of the structure or entire building sufficient to prevent entrance or infiltration of precipitation, wind, and other elements, and prevent undue heat loss from within the enclosed area.

2. Permanent Enclosure: State of construction at which all construction elements necessary to protect the area from moisture, weather, and heat transfer have been provided in accordance with the Contract Documents, either for a portion of the building or structure or its entirety.
3. Temporary Partition: Enclosure of a portion of the building or structure sufficient to separate construction activities from Occupied Areas, including minimizing heat loss from Occupied Areas and migration of dust and moisture into Occupied Areas.
4. Occupied Areas: Areas occupied by CITY's personnel, electronics, or storage areas used by CITY, including offices, lunch rooms, locker rooms, toilet rooms, and rooms containing computers, microprocessors, and control equipment.

1.3 DESCRIPTION OF SYSTEM

A. Provide temporary heating, cooling and ventilating of enclosed areas necessary to:
   1. Facilitate progress of the Work.
   2. Protect the Work and other materials and equipment from precipitation, humidity, dampness, excessive heat, and cold.
   3. Prevent condensation of moisture on the surfaces of materials and equipment.
   4. Raise and maintain temperature of ground, surfaces, materials, and equipment as required for proper execution of the Work and protection of materials and equipment.
   5. Provide suitable ambient temperatures and humidity levels for installing and curing materials and equipment.
   6. Provide adequate ventilation to comply with Laws and Regulations for safe working environments, and as required for proper installation of materials and equipment.
   7. Allow beneficial occupancy of the Work or portion thereof prior to Substantial Completion, including heating and air conditioning, when applicable.

B. Temporary Partitions:
   1. Provide Temporary Partitions required to effectively separate Occupied Areas from construction activities.
   2. Provide Temporary Partitions required to protect Occupied Areas from noise, dust, and other hazards and nuisances associated with construction activities.

C. Temperature Required:
   1. Except where otherwise specified, temporary heating and cooling shall maintain temperature between 50 degrees F and maximum design temperature of building or facility and its contents for the area(s) served by such temporary heating and cooling.
   2. Maintain temperature of Occupied Areas between 65 degrees F and 80 degrees F with relative humidity less than 75 percent.
   3. Required temperature range for certain Work, including preparation of materials and surfaces, installation or application, and curing as applicable,

shall be in accordance with the Contract Documents applicable to such elements of the Work and Supplier's recommended temperature range for the application or installation.

4. Storage Areas: Required temperature range shall in accordance with the Contract Documents and Supplier's storage instructions for each material or equipment item, including Section 01 66 00, Product Storage and Handling Requirements.
5. Provide Temporary Enclosures required for maintaining required temperature and humidity levels.

D. Ventilation Required:
   1. General:
      a. Prevent accumulation in construction areas of hazardous and nuisance levels or concentrations of dust and particulates, mist, fumes and vapors, odors, and gases.
      b. Temporary ventilation shall not exhaust to or disperse hazardous and nuisance substances into Occupied Areas or areas where construction work is in progress.
      c. Discharge exhaust to locations that do not result in harmful or nuisance exposure to people, operations of other contractors, CITY's operations, or damage to property.
      d. Properly ventilate spaces where hazardous or volatile materials are stored.
   2. Provide adequate ventilation for:
      a. Curing installed materials.
      b. Maintaining humidity levels required for suitable conditions for the Work.
      c. Cooling areas around electrical components to less than 100 degrees F.

1.4 USE OF CITY'S SYSTEMS

A. Existing Heating, Cooling and Ventilating Systems:
   1. Do not use systems in existing structures or buildings for temporary heating and ventilating without CITY's written permission and basis mutually agreed upon by the parties for proportionate sharing of costs.

B. Use of Permanent Heating, Cooling, and Ventilating System Provided Under the Project:
   1. Permanent heating and ventilating systems may be used for providing temporary heating and ventilating when the following conditions are met:
      a. Obtain DEPARTMENT's written permission to use permanent systems.
      b. Building or structure must fulfill requirements of Permanent Enclosure.
      c. Permanent system shall be substantially complete, including complete functionality of all controls.
      d. Permanent heating and cooling system, including related piping systems, strainers, filters, controls, and other appurtenant items shall be fully capable of proper operation.

e. Permanent ventilation systems, including ductwork, control devices, insulation, filters, and associated items shall be fully-capable of proper operation.
f. General CONTRACTOR shall pay all costs while using permanent systems for temporary heating, cooling or ventilating, including operation, maintenance, filter replacement, and providing replacement parts and consumables.
g. Prior to certification of Substantial Completion, General CONTRACTOR shall return systems to their condition prior to use for the Project. Replace all filters, parts, and consumables used during the Project.

PART 2 – PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for temporary systems may be new or used; shall be adequate for purposes intended; shall not create unsafe conditions; and shall comply with Laws and Regulations and orders of authorities having jurisdiction.

B. Provide all required temporary facilities, including piping, wiring, and controls. Provide required temporary utilities and consumables.

C. Portable Space Heaters:
1. When used, portable space heaters that burn oil, natural gas, or propane shall comply with Laws and Regulations and shall have the following:
a. Safety controls against explosion, overheating, and carbon monoxide accumulation.
b. Appropriate vents.
c. Adequate combustion air.
2. Do not use electric heaters for temporary heating.

D. Provide Temporary Enclosures to protect the Work and materials and equipment.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install temporary heating, cooling, ventilating, and enclosures in neat, orderly, manner, and make structurally, mechanically, and electrically sound throughout.

B. Location of Temporary Systems:
1. Locate temporary heating, cooling, and ventilating systems to provide uniform distribution of heat and uniform air movement through each area served.

2. Temporary systems shall not interfere with or provide hazards or nuisances to: the Work under this and other contracts, movement of personnel, traffic areas, materials handling, storage areas, finishes, and work of utility owners and others.

C. Modify and extend temporary systems as required by progress of the Work.

D. Protect permanently-installed, direct-radiation units, such as convectors and finned pipes, with temporary sheet metal enclosures.

3.2 USE

A. Maintain temporary systems to provide safe, continuous service at required times, safe working conditions, and required temperature, humidity levels, and air quality emissions.

B. Properly supervise operation of temporary heating, cooling, and ventilating equipment:
   1. Enforce compliance with Laws and Regulations, permits, and orders of authorities having jurisdiction.
   2. Enforce safe practices.
   3. Prevent abuse of services.
   4. Prevent damage to finishes.
   5. Ensure that temporary facilities and equipment do not interrupt continuous progress of construction.

C. At end of each work day, check temporary heating and cooling systems and verify that sufficient fuel is available to maintain heating and cooling until work is resumed at the Site. Provide fuel and consumables when supply on-hand is insufficient.

3.3 REMOVAL

A. Completely remove temporary facilities, temporary utilities, equipment, and materials when no longer required. Repair damage caused by temporary facilities and their removal and restore the Site to condition in accordance with the Contract Documents; if restoration of damaged areas is not specified, restore to preconstruction condition.

B. Where temporary services are disconnected from existing, permanent utility, provide suitable, gastight cap or blind flange, as applicable, on service line, in accordance with requirements of the utility owner.

C. When permanent heating, cooling, and ventilating facilities were used for temporary heating, cooling, and ventilating, upon Substantial Completion provide new replaceable-type filters and consumables, and clean permanent filters.

+ + END OF SECTION + +

SECTION 01 51 26

TEMPORARY LIGHTING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. General CONTRACTOR shall provide temporary lighting for the Project.
   2. General CONTRACTOR shall pay cost of temporary lighting, including costs of installation, maintenance, and removal.
   3. Provide temporary lighting throughout the Project. At minimum, provide temporary lighting through Substantial Completion of the entire Project and removal of temporary field offices and sheds.
   4. Electric power for temporary lighting is specified in Section 01 51 13, Temporary Electricity.

B. Provide temporary lighting as follows:
   1. Work Lighting: Lighting required for adequate illumination of work areas under this Contract and other contracts.
      a. Required Illumination for Work Lighting:
         1) Unless Specified Otherwise: Not less than five foot-candles.
         2) Stairs: Ten foot-candles.
         3) Construction Plant and Shops: Ten foot-candles.
         4) For Detail and Finishing Work: Twenty foot-candles.
         5) For Testing and Inspection: Thirty foot-candles.
         6) At First-aid Stations: Thirty foot-candles.
         7) Areas of CITY's Operations: One 300-watt lamp at intervals of 15 feet on centers.
      b. Periods of Service for Work Lighting: Continuous from 15 minutes prior to and 15 minutes past scheduled work hours on workdays
   2. Safety Lighting: Lighting required for:
      a. Adequate illumination for safe movement of authorized persons throughout the Site.
      b. Adequate illumination for public safety, when applicable.
      c. Special warning lighting for hazardous conditions.
      d. Required Illumination for Safety Lighting:
         1) Unless Specified Otherwise: Not less than five foot-candles.
         2) For Potentially Hazardous Conditions: As required by Laws and Regulations.
      e. Periods of Service for Safety Lighting:
         1) Within the Site (areas without public access): At all times that authorized personnel are present.

2) Public Access Areas: At all times.

3. Security Lighting: Lighting required to assist in protecting the Project from unauthorized entry. Provide within 50 feet of all parts of the Project. Provide during hours of darkness, with photocell control.
4. Temporary field offices and sheds, storage areas, and other temporary construction facilities. Provide temporary lighting as specified and required, with continuous service.

C. Restrictions:
1. Existing Systems: Cannot be used for temporary lighting.
2. Permanent System Provided Under the Project: Obtain DEPARTMENT's written permission for using permanent system provided under the Project, indicating conditions of use. When permanent system is used for temporary lighting, provide temporary lamps for temporary lighting.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Materials and equipment used for temporary lighting may be new or used, and shall be in fully serviceable condition and adequate for the service intended. Temporary lighting shall not create unsafe conditions. Comply with Laws and Regulations including the NEC and, where applicable, requirements of electric utility owner.

B. Provide all required facilities for temporary lighting, including wiring, switches, accessories, and supports.

C. At CONTRACTOR's option, UL-approved, patented, specialty products may be used.

D. Receptacles and Fixtures:
1. Standard materials and equipment shall comply with UL requirements.
2. Provide heavy-duty guards on fixtures.
3. Provide appropriate types of fixtures for the environment in which fixture is used, in accordance with applicable NEC articles and NEMA standards.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install temporary lighting in neat, orderly manner. Temporary lighting system shall be structurally and electrically sound throughout.

B. Modify and extend temporary lighting as progress of the Project requires.

C. Locate temporary lighting to avoid providing or contributing to hazards and interfering with the Work, movement of personnel, hoisting, materials handling, storage, traffic areas, existing operable facilities, and work under other contracts

D. Install switches for temporary lighting at entrance to each area, or successive areas, so that access to all areas of the Site is via lighted areas.

3.2 USE

A. Properly supervise use of temporary lighting. Enforce compliance with Laws and Regulations and safe practices, and prevent abuse of services.

3.3 REMOVAL

A. Completely remove materials and equipment associated with temporary lighting when temporary lighting is no longer required.

B. Repair damage caused by temporary lighting and its removal, and restore the Site to condition in accordance with the Contract Documents; if restoration of damaged areas is not specified, restore to preconstruction condition.

C. Prior to inspection for Substantial Completion, remove temporary lamps provided in permanent fixtures used for lighting during the Work and provide new lamps in their place.

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SECTION 01 51 36

TEMPORARY WATER

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. General CONTRACTOR shall provide temporary water for entire Project, as specified in this Section and indicated elsewhere in the Contract Documents.
   2. Summary of Overall Responsibilities for Temporary Water Service:
      a. Pay all costs for temporary water service facilities, including installation, maintenance, and removal.
      b. Obtain permits and pay fees and deposits required by owner of existing water system and authorities having jurisdiction.
      c. Provide required facilities including piping, valves, meters if not provided by owner of existing waterline, backflow preventers, pressure regulators, vacuum breakers, and appurtenances. Provide freeze-protection as required.
      d. Provide water for temporary sanitary facilities, field offices, Site cleaning and, when applicable, disinfecting and testing of facilities and systems.
      e. Continuously maintain adequate water flow and pressure for all purposes during the Project, until removal of temporary water system. Provide temporary booster pumps, tanks, compressors, and appurtenances as required for maintaining flow and pressure.
      f. Should CITY occupy part of the Project prior to Substantial Completion of the entire Project, cost of water consumed by CITY via temporary water service will be shared proportionately between DEPARTMENT and CONTRACTOR on a basis mutually agreed to by the parties.
   3. Maintain (including cleaning) temporary water facilities and continuously provide consumables.
   4. Facilities shall be adequate for personnel using the Site and requirements of the Project.
   5. Provide facilities in compliance with Laws and Regulations, requirements of authorities having jurisdiction and, when applicable, requirements of the water utility owner.

B. Each contractor shall provide water hoses from hose bibs or hydrants, as applicable, to point of operations required for their work.

1.2 USE OF OWNER'S SYSTEM

A. Restrictions:

1. Existing Systems: Modify and extend existing system for temporary water service.
2. Obtain CITY's permission to use water from hydrants.
3. Permanent System Provided Under the Project: Obtain DEPARTMENT's written permission for using permanent water system provided under the Project, indicating conditions of use.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Materials may be new or used, and shall be adequate for the purpose required.

B. When connecting to existing waterline at location other than existing fitting, provide suitable stainless steel tapping sleeve with appropriate valve. Do not remove existing waterline from service for tapping without first obtaining written permission from owner of the waterline.

C. Temporary Backflow Preventers:
   1. Shall be reduced pressure zone type with an air gap between discharge point and drain.
   2. Size and Capacity: Sufficient for the water flow and pressure requirements of the temporary water system.
   3. Backflow preventers shall comply with Laws and Regulations and continually have a valid test certificate signed by a backflow preventer technician licensed by the authority having jurisdiction at the Site.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Installation – General:
   1. Install temporary water service in a neat, orderly manner. Temporary water system shall be structurally and mechanically sound throughout.
   2. Locate temporary piping, hose bibs, and hydrants as applicable to provide temporary water service convenient to work areas. Avoid interfering with the Work, traffic and work areas, materials handling equipment, OWNER's operating areas, storage areas, and work under other contracts.
   3. Do not locate backflow preventers in basements or in underground chambers. When backflow preventer or other element of the temporary water system is outdoors and subject to potential freezing, provide adequate freeze protection.
   4. Provide sufficient and adequately located appurtenances, such as booster pumps, pressure reducers, vacuum breakers, and other items necessary for proper operation of the temporary water system.

5. Do not run piping on floor or on ground.
6. Provide drip pan or bucket under each hose bib located within building or structure, and connect drain to sewer, or empty pan or bucket when half-full.

B. Modify and extend temporary water service as required by progress of the Project.

C. Where potable water is required or advisable, disinfect temporary water prior to use, in accordance with Laws and Regulations and requirements of authorities having jurisdiction.

3.2 USE

A. Use – General:
1. Properly supervise temporary water service.
2. Enforce compliance with Laws and Regulations and requirements of authorities having jurisdiction.
3. Enforce sanitary practices.
4. Prevent abuse of services and avoid creating nuisances.
5. Prevent wasteful use of water.
6. Protect system from freezing.

3.3 REMOVAL

A. Completely-remove temporary facilities, including temporary materials and equipment, when no longer required. Repair damage caused by temporary facilities and their removal and restore the Site to condition in accordance with the Contract Documents; if restoration of damaged areas is not specified, restore to preconstruction condition.

B. Where temporary water service is disconnected from existing waterline, provide suitable, disinfected watertight cap or blind flange, as applicable, on service line, in accordance with requirements of owner of waterline.

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SECTION 01 52 11

ENGINEER'S FIELD OFFICE

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes requirements for CONTRACTOR-provided field office, with furnishings, equipment, and consumables, for use by ENGINEER and CONTRACTOR.
   2. General CONTRACTOR shall provide and maintain a field office for ENGINEER's sole use. Provide field office at location approved by ENGINEER.
   3. Field office shall be complete and fully functional within five days after date on which the Contract Times commence running.
   4. Obtain required permits for field offices.

1.2 SUBMITTALS

A. Action Submittals: Obtain ENGINEER's approval of the following prior to staging field office to the Site:
   1. Field Office Submittal: Submit all of the following as one submittal which shall include:
      a. Site plan indicating proposed location of field office, parking for field office, facilities related to the field office, and material of both field office parking and sidewalk or walkway to field office.
      b. Information on proposed field office size, construction, exterior appearance, interior finishes, and field office security measures.
      c. Proposed layout of field office interior, showing location of offices, common areas, restroom, closet, other areas specified (if any), with dimensions indicated for each.
      d. Proposed layout of field office exterior identifying sign, showing all text, font, colors, and graphics (if any).
      e. Proposed type of Internet service; name of proposed Internet service provider; and product data and technical information on equipment (if any) required for Internet service.
      f. Office Equipment: Product data and technical information for copier, telephones, and other office equipment.
      g. Computer System: Product data and technical information on the complete computer system.
      h. Digital Camera: Product data and technical information on camera and accessories.

PART 2 – PRODUCTS

2.1 FIELD OFFICE CONSTRUCTION AND SITE REQUIREMENTS

A. Site at Field Office:
   1. Allocate total of two reserved parking spaces for use by ENGINEER and DEPARTMENT in close proximity to ENGINEER's field office. Parking area shall be paved with bituminous paving, concrete, crushed stone, or other material approved by ENGINEER. Parking area shall be suitably drained and free of standing water during wet weather.
   2. Provide sidewalk or walkway, not less than four feet wide, of bituminous pavement, concrete, crushed stone, or other material approved by ENGINEER, for the full distance between parking area and field office.

B. Field Office, Minimum Construction: Field office shall comply with the following:
   1. Structurally sound foundation and superstructure.
   2. Size: Floor area of not less than 430 square feet, and not less than 10 feet wide.
   3. Completely weather-tight and insulated, with minimum R-19 insulation.
   4. Exterior finish approved by ENGINEER.
   5. New interior finishes approved by ENGINEER, including resilient floor covering in first-class condition.
   6. Field Office Ingress and Egress:
      a. Two doors for ingress and egress for each field office unit, each with landing, stairs, and railing complying with building codes and other Laws and Regulations in effect at the Site.
      b. Landing and stairs shall have slip-resistant walking surfaces, and be metal, pressure-treated wood, fiberglass, or concrete.
      c. Railing shall be metal, wood, or fiberglass.
      d. Door Security:
         1) Doors shall be secure and lockable.
         2) Furnish each door with suitable, lockable security bar. Security bar shall be Master Lock 265DCCSEN Dual-Function Security Bar, or equal.
   7. Windows:
      a. Window area equal to not less than ten percent of floor area.
      b. Windows shall each have insect screen and operable sash.
      c. Provide each window with lock and exterior security bars approved by ENGINEER.
   8. One lockable closet for storage.
   9. Keys:
      a. Furnish to ENGINEER two identical sets of keys suitable for operating all keyed locks, including ingress/egress door locks, security bars for doors, window locks, closets, and office furnishings.
      b. Permanently label each key to indicate its associated lock.

10. Restroom:
    a. Provide in field office one private restroom including one lavatory, one toilet, medicine cabinet with mirror, soap dispenser, and paper towel holder.
    b. Provide each restroom with appropriate electric ventilation fan with positive discharge to location outside the field office.
11. Exterior Sign:
    a. Field office identifying exterior sign, approved by ENGINEER. Sign shall be durable, weatherproof, suitable for long-term exposure to sunlight.
    b. Exterior sign shall be not less than 1.5 feet high by four feet wide, installed at location determined in field and acceptable to ENGINEER.
    c. Sign shall be in color, as presented in the layout below.
    d. Sign layout and general proportions shall be as presented below. Text of first line and last line shall be Arial. Text size and size of graphic shall be proportionate to the graphic below. ENGINEER will furnish graphic as JPG file for use by CONTRACTOR in preparing the sign.

ENGINEER'S FIELD OFFICE

ARCADIS Design & Consultancy for natural and built assets

www.arcadis.com

C. Field Office Optional Construction:
    1. Provide mobile office trailer in first-class condition approved by ENGINEER, specifically designed for use as construction field office and complying with requirements of this Section.
    2. Provide skirting around perimeter of each mobile field office trailer.
    3. Supplier: Provide field office by one of the following:
        a. Pac-Van, Inc.
        b. Modular Space Corporation (ModSpace).
        c. Williams Scotsman, Inc.
        d. Or equal.

2.2 FIELD OFFICE UTILITIES

A. Comply with:
    1. Section 01 51 13, Temporary Electricity.
    2. Section 01 51 16, Temporary Fire Protection.

B. Provide the following for the ENGINEER's field office:
    1. Electrical System and Lighting:

a. Electric service as required, including paying all costs. Provide electrical submeter if electrical service is obtained from CITY's system.
b. Interior lighting of not less than 50 foot-candles at desktop height.
c. Minimum of eight 120-volt, wall-mounted, duplex convenience electrical receptacles.
d. Exterior, wall-mounted lighting at each entrance to field office, not less than 250 watts each.
e. Exterior security light for ENGINEER's field office parking area. Provide one 1000-watt, pole-mounted fixture with photocell control.

2. Heating, Ventilating, and Air Conditioning System:
   a. Provide automatic heating to maintain indoor temperature in field office of not less than 65 degrees F in cold weather. Furnish all fuel and pay all utility costs.
   b. Automatic cooling to maintain indoor temperature in field office of not warmer than 75 degrees F in warm weather.
3. Water and Sewerage:
   a. Provide potable water service for each plumbing fixture associated with field office.
   b. Provide sanitary sewerage for each lavatory/sink and toilet.
   c. Utility Connections – General:
      1) Comply with Laws and Regulations, including plumbing and sewer codes, and requirements of authorities having jurisdiction.
      2) Protect plumbing from freezing.
   d. Potable Water Service: Provide the following:
      1) Type K copper waterline from potable water main to each plumbing fixture.
      2) Reduced pressure zone (RPZ)-type backflow preventer in accordance with Laws and Regulations and requirements of authorities having jurisdiction.
      3) Provide 15-gallon electric hot water tank or tankless hot water heater, and hot water piping to serve each lavatory/sink in field office.
      4) Not less than one exterior hose bibb, with not less than 50 feet of hose, located adjacent to field office sidewalk or walkway, near field office ingress/egress doors. Provide wall-mounted hose reel or hose caddy.
      5) Before placing potable water system into service, disinfect piping and appurtenances in accordance with Laws and Regulations.
   e. Sanitary Sewerage:
      1) Provide PVC or other appropriate piping, arranged in accordance with Laws and Regulations, to convey wastewater from field office to sanitary sewer that discharges to a permitted wastewater treatment facility, or to holding tank provided by CONTRACTOR.
      2) When holding tank is provided, also provide pumping and disposal of holding tank contents at appropriate, regular intervals.
4. Telephone Service:

a. Cellular Telephones and Service: ENGINEER will provide cellular telephones and service for ENGINEER's employees assigned to the field office.

5. Internet Access:
   a. Obtain and pay for Internet service until removal of the field office, with unlimited (untimed) Internet access, for ENGINEER's sole use.
   b. Set up system and appurtenances required and verify functionality in the field office.
   c. Internet service shall be one of the following, listed in order of preference; provide a lower type of access only when the next-higher level is unavailable:
      1) Mobile Broadband Wireless:
         a) Provide mobile broadband wireless 4G network by AT&T, Verizon, Sprint, T-Mobile, or equal, with download speed of not less than 37 Mbps and upload speed of not less than 17 Mbps.
         b) Provide mobile broadband wireless router. Product and Manufacturer: Linksys Wireless-G Router for Mobile Broadband, or equal.
         c) Mobile broadband air-card for field office. Product and Manufacturer: Sierra Wireless 597E, Novatel Merlin EX720, or equal.
         d) Router and air-card will remain CONTRACTOR's property upon removal of field office from the Site.
      2) Satellite:
         a) Provide 4G network service with download speed of not less than 12 Mbps.
         b) Provide required equipment, including outdoor unit (dish) and indoor satellite modem equipment, together with required cabling.
         c) Provide telephone modem in computer, together with telephone line and service, for file uploading.

C. Should actions of utility companies delay the complete set up of field office, CONTRACTOR shall provide temporary electricity, heat, water supply, sanitary facilities, and telephone service as required at no additional cost to DEPARTMENT.

2.3 FURNISHINGS AND EQUIPMENT

A. Provide the following furnishings and equipment:
   1. Desks: Two 5-drawer desks, each with desktop surface five feet long by 2.5 feet wide with not less than one file drawer per desk, suitable for storing 8.5-inch by 11-inch documents.
   2. Desk Chairs: Two new or used (in good condition) five-point, high backed, cushioned swivel chairs with seat-height adjustment.
   3. Other Chairs: Four side chairs with arm rests and padded seats and backs, and eight metal folding chairs without arm rests.

4. Two new or used (in good condition) folding tables each eight feet long by 2.5 feet wide.
5. Two new or used (in good condition) folding tables each four feet long by 2.5 feet wide.
6. Plan rack(s) to hold not less than eight sets of the Drawings.
7. Two 4-drawer file cabinets.
8. One 2-door storage cabinet.
9. Shelving or bookcase with a total of 12 feet of shelf length and not less than 12 inches deep.
10. Four polyethylene waste baskets, each with capacity of not less than seven gallons.
11. Suitable doormat at each exterior ingress/egress door.
12. Two cork tack-boards, each 2.5 feet by three feet, with thumbtacks.
13. One white board for use with dry markers, approximately six feet by four feet, with marker holding tray, installed by CONTRACTOR at location directed by ENGINEER in the field office. Furnish supply of colored markers and eraser for the white board.
14. Safety Equipment: Provide the following:
    a. Fire extinguishers with associated signage.
    b. Smoke detector with supply of batteries.
    c. Carbon monoxide detector with power supply.
    d. Provide in accordance with Laws and Regulations. For each field office structure, provide not less than two wall-mounted fire extinguishers, one battery-operated ceiling-mounted smoke detector, and one carbon monoxide detector suitably installed.
15. First-Aid Station:
    a. In addition to first-aid stations otherwise required by the Contract Documents, provide for ENGINEER's sole use a first-aid station in ENGINEER's field office.
    b. Product and Manufacturer: Zee Medical USA, Item 0152, "Medium Four-Shelf Plastic Cabinet", www.zeemedical.com; or equal.
16. Weather Monitoring Station:
    a. Monitoring Capability: System shall measure: wind speed, wind direction, outdoor temperature, wind chill, time, date, indoor temperature, and rainfall.
    b. Manufacturer and Product:
        1) Weather Monitoring Station: Provide Peet Bros. ULTIMETER 100; or equal.
        2) Rain Gauge: Provide Peet Bros. ULTIMETER PRO Rain Gauge, or equal.
    c. Sensors:
        1) Cable-mounted sensors installed outdoors. Wireless systems are unacceptable.
        2) Vane-type wind sensor equipped with 40-foot cable, accurate to wind speeds as low as 1.5 mph.

3) Temperature sensor, installed in the shade, equipped with 25-foot cable.
4) Provide rain gauge for monitoring rainfall/precipitation, with 40-foot cable. Rain gauge shall be suitable for use in winter weather and accurate to 0.01-inch.
5) Sensors and cabling shall be compatible with the weather monitoring recording/display unit.
6) Install sensors at appropriate locations, agreed upon at the Site with ENGINEER, for optimal monitoring of weather. Provide required poles and mounting brackets as required for installation of sensors.

d. Recording/Display Unit: Unit shall have keyboard and data display, featuring maximums and minimums of all data monitored, displayed and stored in-unit for the following periods: current day, each of the previous seven days, and long-term. Display and record time and date for each recorded maximum and minimum. Individually-resettable memories and master-reset capability to clear all memory.

e. Appurtenances:
1) Provide data logging capability to allow data to be transmitted to and displayed on personal computer in ENGINEER's field office. Provide data relay capability to transmit data to such computer.
2) Provide required appurtenances including junction boxes, 120-volt power supply with transformer, all required cords and cabling, and mounting brackets and hardware.

f. Provide all items and Work necessary for a fully-operational unit with properly-functioning capability as specified.

17. Personal Protective Equipment for Visitors: Furnish the following:
a. Protective Helmets (Hard Hats): Four, each with full brim, of fiberglass or thermoplastic; each with ratchet suspension; white in color.
b. Safety Glasses: Four, each with clear lenses, polycarbonate, anti-fog and anti-scratch coating, suitable to fit over personal eyewear.
c. Reflective Safety Vest: Four, each of polyester mesh or other material acceptable to ENGINEER, color to be high-visibility orange, with one-inch-wide reflective tape, one-size-fits-all design.
d. Earplugs: Supply of foam, disposable earplugs. Promptly resupply when stock is depleted.

18. Two electric clocks.
19. One electric coffee maker, with ten-cup capacity or larger.
20. Bottled water with electric cooler dispenser for five-gallon bottles, with cup dispenser.
21. Computer System:
a. Computer: ENGINEER will furnish computers and software required for ENGINEER's personnel assigned to the field office.
b. Printer/Copier/Scanner:
1) System Description: Provide one inkjet printer/copier/scanner with color printing capability.
2) Manufacturer and Model: Provide one of the following:

a) Brother Printer MFC J5720DW Wireless Color Inkjet All-in-One Printer.
b) Canon PIXMA iX6820 Inkjet Business Printer.
c) Or equal.

3) Sheet Size: Capable of printing 8.5-inch by 11-inch, 8.5-inch by 14-inch, and 11-inch by 17-inch sheets.
4) Printing Speed: 20 pages per minute (black and white), 18 pages per minute (color).
5) Scanning: Capable of scanning to PDF and JPG files, selectable by the user.
6) Ink Cartridges: Provide all cartridges required for full-color printing, and promptly replace cartridges as needed throughout the Project.

c. Wireless Router:
1) Provide wireless router to be configured by ENGINEER.
2) Router capacity shall be not less than 54 Bbps.
3) Manufacturer: Router shall be Linksys, or equal.

22. Copier: Furnished under the "Computer System" paragraph, above.
23. Digital Camera:
a. Furnish one point-and-shoot digital still camera with built-in flash for use by ENGINEER for duration of the Project.
b. Manufacturer and Product: Furnish one of the following:
1) Canon PowerShot A1300 16.0 MP Digital Camera.
2) Nikon COOLPIX S33 Waterproof Digital Camera.
3) Or equal,
c. Camera shall have not less than 4x optical zoom, 13.0 megapixel resolution, equipped with 2.7-inch low temperature polycrystalline silicon color LCD. Camera shall be capable of shooting 720 dpi digital video.
d. Furnish compatible USB type interface cable and software necessary to download photographs from camera to ENGINEER's computer.
e. Appurtenances: Furnish the following with each camera:
1) One 8-GB memory card compatible with camera.
2). Four nickel-cadmium rechargeable batteries suitable for camera, with charger.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install field office and related facilities in accordance with Laws and Regulations.

B. Install materials and equipment, including prefabricated structures, in accordance with manufacturer's instructions, and to provide optimal performance and accuracy.

3.2 CLEANING, MAINTENANCE, AND SUPPLIES

A. Furnish the following maintenance services:
   1. Immediately repair malfunctioning, damaged, leaking, or defective field office structure, site improvements, systems, and equipment.
   2. Provide computer supplies and pay for maintenance on CONTRACTOR-furnished computer system and copier.
   3. Promptly provide snow and ice removal for ENGINEER's field office, including parking area, walkways, and stairs and landings.
   4. Provide continuous maintenance and janitorial service of field office and sanitary facilities. Clean field office not less than once per week Sweep or vacuum field office not less than daily, or more-frequently when site conditions are such that dirt or mud is frequently tracked into field office. Clean and wax (as appropriate) flooring every six months.
   5. Waste Disposal:
      a. Properly dispose of trash and waste as needed, not less than twice per week.
      b. Properly handle and dispose of recyclables. Do not dispose of recyclables as trash.
      c. Dispose of other waste, if any, as required, to avoid creation of nuisances and adverse environmental effects. Properly dispose of electronic waste, when necessary, at proper waste receiving facility.

B. Consumables: Provide the following consumables as needed:
   1. Toner and ink cartridges for printers and copier, as required.
   2. Paper supplies for printer and copier. Always maintain in field office not less than one ream of each size of paper for which printer and copier are capable.
   3. Dry markers in six colors and white board eraser set. Replace markers when exhausted or lost.
   4. Bottled water suitable for water dispenser and disposable cups.
   5. Coffee supplies, including coffee, filters, cups, sugar, creamer, and stir-sticks.
   6. Hand-soap, paper towels, toilet paper, cleansers, and janitorial implements, including broom.
   7. Batteries for smoke detector and other battery-powered items furnished by CONTRACTOR.
   8. Replace fire extinguishers upon expiration.
   9. Not less-often than monthly, inspect first-aid kit and inventory items consumed or used and remove items that are at or near their expiration date. Promptly replace and restock consumed and expired items.

3.3 REMOVAL

A. Remove field office and furnishings when directed by ENGINEER, prior to inspection for final completion. Deliver specified equipment to DEPARTMENT.

+ + END OF SECTION + +

SECTION 01 52 13

CONTRACTOR'S FIELD OFFICE AND SHEDS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. General CONTRACTOR shall provide a temporary field office for ENGINEER's and general CONTRACTOR's use with not less than the minimum facilities specified. See also Section 01 52 11, Engineer's Filed Office.
   2. Provide required temporary storage and work sheds.
   3. Obtain and pay for required permits and utilities. Field offices and sheds shall comply with Laws and Regulations.

B. Coordination:
   1. Coordinate with CITY, other contractors, and others using the Site the location of field offices and sheds, including contracts indicated in Section 01 12 13, Summary of Work.

C. Location:
   1. Locate field offices and sheds in accordance with the Contract Documents and in accordance with the Site mobilization discussions at the preconstruction conference.

D. Furnish in CONTRACTOR's field office one complete set of the Contract Documents for ready reference by interested persons. In addition to the reference set, comply with Section 01 78 39, Project Record Documents and related provisions of the General Conditions, as may be modified by the Supplementary Conditions.

PART 2 – PRODUCTS

2.1 FIELD OFFICE AND SHEDS – FURNISHINGS, AND EQUIPMENT

A. Contractor's Field Office and Furnishings:
   1. Construction: As required by CONTRACTOR and sufficient for Project meetings.
   2. Utilities and Services: Provide the following:
      a. Telephone service.
      b. Computer network and related facilities as required for CONTRACTOR's needs.

c. Utilities and related facilities for lighting and maintaining temperature, in accordance with Section 01 52 11, Engineer's Field Office.

3. Furnishings:
   a. Conference Facilities: Provide conference area with conference table and chairs sufficient for 12 people. Conference facilities and furnishings shall be provided with suitable utilities, lighting, ventilation, and temperature controls prior to the first progress meeting, unless otherwise approved by ENGINEER.
   b. Other furnishings required by CONTRACTOR.
4. Provide on field office's exterior an identification sign displaying CONTRACTOR's company name. Maximum size of sign shall be four feet by eight feet. Sign shall be suitable for outdoor use for the duration of the Project.
5. Furnish and maintain at CONTRACTOR's field office 12 protective helmets ('hard hats") for use by visitors to the Site.

B. Contractor's Storage and Work Sheds:
   1. Provide storage and work sheds sized, furnished, and equipped to accommodate personnel, materials, and equipment involved in the Work, including temporary utility services and facilities required for environmental controls sufficient for personnel, materials, and equipment.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Installation:
   1. Install CONTRACTOR's temporary field offices, sheds, and related facilities in accordance with Laws and Regulations.
   2. Install materials and equipment, including prefabricated structures, in accordance with manufacturer's instructions.

3.2 MAINTENANCE AND REMOVAL

A. Maintenance:
   1. Clean and maintain field offices and sheds as required.
   2. Provide consumables as required.

B. Removal:
   1. Do not remove temporary field offices and sheds until after Substantial Completion of the entire Work, unless otherwise approved by ENGINEER.
   2. Remove field offices and sheds and restore areas prior to final inspection.

+ + END OF SECTION + +

SECTION 01 52 16

FIRST AID FACILITIES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes requirements for temporary first-aid facilities for personnel use at Site during construction, including first-aid stations, lists of emergency contact information, and first-aid-trained personnel.
   2. General CONTRACTOR shall provide first-aid facilities during the Project, including:
      a. Paying all costs for first-aid facilities, including installation, maintenance, and removal.
      b. Maintaining, including cleaning, first-aid facilities. Keep first-aid facilities continuously supplied with consumables.
      c. Facilities shall be adequate for personnel using the Site.
      d. Providing facilities in compliance with Laws and Regulations.

1.2 TEMPORARY FIRST-AID FACILITIES REQUIRED

A. Provide the following temporary first-aid facilities:
   1. First-aid Stations at the Site:
      a. Provide temporary first-aid stations at or immediately adjacent to the Site's major work areas, and inside CONTRACTOR's temporary field office.
      b. Locations of first-aid stations shall be determined by CONTRACTOR's safety representative.
      c. Other contractors shall provide first-aid stations in their own field office.
      d. First-aid stations shall be adequate for the number of personnel at the Site and the types of work and hazards anticipated.
      e. Not less-often than monthly, inspect each temporary first-aid station and inventory items consumed or used and remove items that are at or near their expiration date. Promptly replace and restock consumables and expired items.
   2. Emergency Contact List:
      a. Provide list of emergency telephone numbers at each hardwired telephone at the Site.
      b. List shall be in accordance with the list of emergency contact information required in Section 01 35 23, Safety Requirements.

3. Personnel Trained in First-Aid:
    a. When work is in progress, furnish at the Site not less than one person trained in first-aid.
    b. First-aid-trained personnel shall possess valid certificate indicating that they have successfully completed first-aid training course by the American Red Cross or similar entity.

B. Restrictions:
    1. Existing Facilities: In general, CITY's existing first-aid facilities shall not be used by contractors without written permission of CITY with conditions for use. Exceptions include life-threatening situations. When used, promptly and completely restock and restore such facilities with identical items.
    2. Permanent Facilities Provided Under the Project: In general, contractors shall not use permanent first-aid facilities provided under the Project. Exceptions include life-threatening situations. When used, promptly and completely restock and restore such facilities with identical items.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 USE

A. Use of Temporary Facilities:
    1. Properly supervise temporary facilities.
    2. Properly dispose of wastes.

3.2 REMOVAL

A. Completely remove temporary facilities and materials when no longer required. Repair damage caused by temporary facilities and their removal and restore Site to condition required by the Contract Documents; if restoration of damaged areas is not specified, restore to preconstruction condition.

+ + END OF SECTION + +

SECTION 01 52 19

SANITARY FACILITIES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes requirements for temporary sanitary facilities, including toilet facilities, drinking water for personnel, and personnel washing facilities.
   1. General CONTRACTOR shall provide all temporary sanitary facilities required for the Project.
      a. Make all arrangements with temporary sanitary facility providers for temporary sanitary services and obtain required permits and approvals for temporary sanitary facilities and associated services.
      b. Pay all costs for temporary sanitary facilities and associated services, including cost of electricity, water, fuel, and other utility services required for temporary sanitary facilities.
      c. Continuously maintain adequate temporary sanitary facilities for all purposes during the Project, until removal of temporary sanitary facilities. At minimum, provide and maintain temporary sanitary facilities through Substantial Completion and removal of temporary field offices and sheds, and at all times thereafter when CONTRACTOR is at the Site performing Work.
      d. Maintain and clean the temporary sanitary facilities and continuously provide consumables as required.
      e. Temporary sanitary facilities shall be adequate for personnel using the Site and requirements of Project.
      f. Provide temporary sanitary facilities in compliance with Laws and Regulations and, when applicable, requirements of utility owners.

1.2 REQUIREMENTS FOR TEMPORARY SANITARY FACILITIES

A. Sanitary Facilities.
   1. Portable Toilets:
      a. Provide suitably-enclosed, temporary chemical or self-contained toilets for CONTRACTOR's employees and visitors to the Site.
      b. Location of temporary toilets shall be acceptable to CITY.

1.3 USE OF OWNER'S SYSTEM

A. Existing Sanitary Facilities:
   1. Do not use facilities in existing buildings or structures for temporary sanitary facilities without written permission of CITY and mutually acceptable basis agreed upon by the parties for proportionate sharing of costs between CITY and CONTRACTOR.

PART 2 – PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for temporary sanitary facilities may be new or used, but shall be adequate for purposes intended and shall not create unsafe conditions, and shall comply with Laws and Regulations.

B. Provide required materials, equipment, and facilities, including piping, wiring, and controls.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install temporary sanitary facilities in neat, orderly, manner, and make structurally, mechanically, and electrically sound throughout.

B. Location of Temporary Sanitary Facilities:
   1. Locate temporary sanitary facilities for proper function and service.
   2. Temporary sanitary facilities shall not interfere with or provide hazards or nuisances to: the Work under this and other contracts, movement of personnel, traffic areas, materials handling, hoisting systems, storage areas, finishes, and work of utility companies.

C. Modify and extend temporary sanitary facilities as required by progress of the Work.

3.2 USE

A. Maintain temporary sanitary facilities to provide safe, continuous service as required.

B. Supervision and Enforcement of Use:
   1. Properly supervise operation of temporary sanitary facilities.
   2. Enforce compliance with Laws and Regulations.
   3. Enforce safe practices.
   4. Prevent abuse of services.

5. Prevent nuisances and hazards caused by temporary sanitary facilities and their use.
6. Prevent damage to finishes.
7. Ensure that temporary sanitary facilities do not interrupt continuous progress of the Work.

C. Checks and Consumables:
   1. At end of each work day, check temporary sanitary facilities and verify that sufficient consumables are available to maintain operation until work is resumed at the Site.
   2. Provide additional consumables if the supply on hand is insufficient.

3.3 REMOVAL

A. Completely remove temporary sanitary facilities and materials when no longer required. Repair damage caused by temporary sanitary facilities and their removal and restore the Site to condition required by the Contract Documents; if restoration of damaged areas is not specified, restore to pre-construction condition.

+ + END OF SECTION + +

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SECTION 01 55 13

ACCESS ROADS AND PARKING AREAS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. General CONTRACTOR shall provide temporary construction roads, walks, parking areas, and appurtenances required during the Project for use by general CONTRACTOR, other contractors employed on the Project, ENGINEER, DEPARTMENT, CITY's employees, and emergency vehicles.
   2. Temporary roads and parking areas shall be designed and maintained by general CONTRACTOR and shall be fully passable to vehicles in all weather conditions.

B. Use of Existing Access Roads:
   1. CONTRACTOR is allowed to use CITY's existing roads starting on the Effective Date of the Contract and satisfying other Contract requirements relative to starting the Work.
   2. Prevent interference with traffic on existing roads and parking areas. Always keep access roads and entrances serving the Site clear and available to CITY, facility manager, and their respective employees; emergency vehicles; and other contractors. Do not use access roads or Site entrances for parking or storage of materials or equipment.
   3. CONTRACTOR shall indemnify and hold harmless DEPARTMENT, CITY and ENGINEER from expenses and losses caused by CONTRACTOR's operations over existing roads, drives, and parking areas.
   4. Schedule deliveries to minimize use of driveways and Site entrances.

1.2 SITE ACCESS

A. Site Access:
   1. CONTRACTOR access to the Site shall be as shown on the drawings.
   2. Access to the Site is limited to a maximum weight of H20 loading.

1.3 CONTRACTOR PARKING

A. All prime CONTRACTOR employee vehicles shall park in area(s) as shown on the drawings. Parking is limited at the Site and it will be necessary to secure offsite parking and carpool employees to the Site.

B. Park construction vehicles and equipment in work areas off of permanent roads and parking areas, in areas of the Site designated for CONTRACTOR staging.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Materials for temporary roads and parking areas shall comply with the Contract Documents' requirements for permanent roads, drives, and parking areas.

B. Traffic controls shall comply with requirements of authorities having jurisdiction for requirements on State Route 207 for the entrance to Washington Lake Filtration Plant. When such authority is the CITY for site roads, and no requirements are indicated, comply with the standard specifications of the state department of transportation in the area of the Project.

PART 3 – EXECUTION

3.1 TEMPORARY ROADS AND PARKING AREAS

A. Temporary Roads and Parking in Areas Different from Permanent Pavement:
   1. Provide temporary roads and parking areas adequate to support and withstand traffic loads during the Project. Locate temporary roads and parking areas as shown on the Drawings.
   2. Provide reasonably-level, graded, well-drained subgrade of satisfactory soil material, compacted to not less than 95 percent of maximum dry density in the upper six inches.
   3. Where required to support loads and provide separation between subgrade and subbase materials, provide geosynthetic separation fabric as required.
   4. Subbase:
      a. Provide crushed stone subbase material not less than twelve inches thick, roller-compacted to a level, smooth, dense surface.
      b. Subbase for temporary roads and areas traveled by construction vehicles shall be adequate for loads and traffic served.

B. Temporary Roads and Parking in Same Areas as Permanent Pavement:
   1. Provide temporary roads and parking areas adequate to support and withstand traffic and construction loads during the Project. Locate temporary roads and parking areas in same location as permanent roads and parking areas. Extend temporary roads and parking areas, within construction limits indicated, as required for construction operations.
   2. Coordinate elevations of temporary roads and parking areas with permanent roads and parking areas.
   3. Prepare subgrade, subbase, and base for temporary roads and parking areas in accordance with the Contract Documents requirements for permanent roads, drives, and parking areas.

4. Where required by subgrade conditions and construction loads and traffic, provide geosynthetic separation fabric as required on compacted subgrade for subbase support and separation of subbase and subgrade materials.
5. Re-condition granular subbase of temporary roads and parking areas, including removing and properly disposing of granular material that has become intermixed with soil, re-grading, proof-rolling, compacting, and testing.

3.2 TRAFFIC CONTROLS

A. Traffic Controls:
   1. Provide temporary traffic controls at intersections of temporary roads with each other and with parking areas, including intersections with other temporary roads, intersections with public roads, and intersections with permanent access roads at the Site.
   2. Provide temporary warning signs on permanent roads and drives, and provide temporary "STOP" signs for traffic on temporary roads where required and at entrances to permanent pavement.
   3. Comply with requirements of authorities having jurisdiction.

3.3 MAINTENANCE OF ROADS

A. General:
   1. Maintain temporary roads and parking to continuously provide at the Site access for construction vehicles and trucks, CITY vehicles, deliveries for CITY, emergency vehicles, and parking areas for CITY's personnel.
   2. Public roads shall be passable at all times unless a road closure is allowed in writing by authority having jurisdiction.
   3. When granular material of temporary roads and parking without hard surfacing become intermixed with soil or when temporary roads otherwise create a nuisance, remove intermixed granular-and-soil material and replace with clean granular material as required.
   4. Provide snow and ice removal for temporary roads and parking areas.

B. Cleaning and Dust Control:
   1. Cleaning: Clean paved surfaces over which construction vehicles travel. Perform cleaning not less often than the frequency indicated in Section 01 74 05, Cleaning, or more frequently as directed by ENGINEER, by mechanical sweeping or other means acceptable to ENGINEER.
   2. Clean the following surfaces:
      a. Roads within limits of the Project.
      b. Permanent roads at the Site between the Site entrance and the work areas, and between the Site entrance and construction parking and staging areas.
      c. Public roads that require sweeping and cleaning due to construction operations.
   3. Dust Control:

a. Control dust resulting from construction activities to prevent nuisances at the Site and in nearby areas.

C. Protection of Underground Facilities: Comply with the General Conditions, as may be modified by the Supplementary Conditions, Section 01 71 33, Protection of the Work and Property, and other requirements of the Contract Documents.

3.4 REMOVALS AND RESTORATION

A. Removals:
1. Remove temporary roads, drives, walks, and parking areas that are not intended for, or acceptable for, integration into permanent pavement or shown to remain on the Drawings. Return areas of temporary roads, drives, walks, and parking to pre-construction condition unless otherwise required by the Contract Documents.
2. Remove temporary gates, fencing, and traffic controls associated with temporary roads and parking areas.
3. Where areas of temporary roads and parking will be permanently landscaped, remove pavement, granular subbase, geosynthetic (where required by ENGINEER), soil, and other materials that do not comply with the Contract Documents regarding fill, subsoil, and landscaping.
4. Remove and properly dispose of materials contaminated with oil, bitumen, and other petrochemical compounds resulting from CONTRACTOR's operations, and other substances that might impair growth of plants and lawns.

B. Restoration:
1. Repair or replace paving, curbs, gutters, and sidewalks affected by temporary roads and parking, and restore to required conditions in accordance with authorities having jurisdiction.
2. Restore to pre-construction conditions existing roads, walks, and parking areas damaged by CONTRACTOR, subject to approval of the owner of affected roads, drives, walks, and parking areas.

+ + END OF SECTION + +

SECTION 01 55 26

MAINTENANCE AND PROTECTION OF TRAFFIC

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall keep all roads, streets, and traffic ways open for passage of traffic and pedestrians during the Work, unless otherwise approved by owner of the street, traffic way, or right-of-way, as applicable.
   2. Construction traffic shall access the Site only via entrance(s) shown on the Contract Drawings.
   3. Unless otherwise shown or indicated in the Contract Documents, maintenance and protection of traffic shall be in accordance with New York State Department of Transportation Standard Specifications.

B. Coordination:
   1. Coordinate with New York State Department of Transportation, as applicable, for maintenance and protection of traffic requirements.
   2. Give required advance notice to fire departments, police departments, and other emergency services as applicable of proposed construction operations.
   3. Give reasonable notice to owners or tenants of private property who may be affected by construction operations. Give such notice not less than two days prior to when such property will or may be affected by construction operations.
   4. Coordinate with requirements of the following:
      a. Section 01 55 13, Access Roads and Parking Areas.
      b. Section 01 71 33, Protection of the Work and Property, regarding temporary barriers.
      c. Section 31 23 05, Excavation and Fill, for temporary barriers at excavations.

1.2 SUBMITTALS

A. Informational Submittals: Submit the following:
   1. Procedure Submittals: Detailed plan, procedures, and sequencing for maintaining and protecting traffic in accordance with the Contract Documents and requirements of authorities having jurisdiction. Include in the submittal the following:
      a. Traffic staging plan, and construction sequencing as applicable to maintain and protect traffic.
      b. Product data, including manufacturer's catalog information and specifications, for temporary signage, temporary signals, temporary

illumination devices, and other products to be utilized in maintaining and protecting traffic.

c. Indication of number and types of personnel dedicated to maintaining and protecting traffic during construction.

d. Indication of plan acceptance from authorities having jurisdiction.

PART 2 – PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment used for maintenance and protection of traffic shall comply with the reference specification indicated in Paragraph 1.1.A.3 of this Section.

PART 3 – EXECUTION

3.1 GENERAL PROVISIONS

A. When required to cross, obstruct, or temporarily close a street or traffic way, provide and maintain suitable bridges, detours, or other acceptable temporary expedient for the accommodation of traffic. Closings shall be for shortest duration practical, and passage shall be restored immediately after completion of filling and temporary paving or bridging.

B. Temporary Control Devices:

1. Provide temporary signs, signals, barricades, flares, lights and other equipment, services, and personnel required to regulate and protect traffic and warn of hazards.
2. Such Work shall comply with requirements of CITY and authorities having jurisdiction at the Site.
3. Remove temporary equipment and facilities when no longer required, and restore grounds to condition indicated in the Contract Documents; if not indicated, resort to pre-construction conditions.

C. Keep accessible for use permanent facilities such as hydrants, valves, fire alarm boxes, postal boxes, delivery service boxes, and other facilities that may require access during construction.

3.2 TRAFFIC SIGNALS AND SIGNS

A. Provide and operate temporary traffic controls and directional signals required to direct and maintain an orderly flow of traffic in areas under CONTRACTOR's control, and areas affected by construction operations.

B. Provide temporary traffic controls and directional signs, mounted on temporary barriers or standard posts, at the following locations:
   1. Each change of direction of a roadway and at each crossroad.
   2. Detours and areas of hazard.
   3. Parking areas.
   4. Traffic entrance to and exit from each construction area.

3.3 TRAFFIC CONTROL PERSONNEL

A. General:
   1. When construction operations encroach on traffic lanes, furnish qualified and suitably-equipped traffic control personnel as required for regulating traffic and in accordance with requirements of authorities having jurisdiction.
   2. Traffic control personnel shall use appropriate flags or mobile signs.
   3. Equip traffic control personnel with appropriate personal protection equipment and suitable attire.
   4. Attire and conduct of traffic control personnel shall be appropriate and shall not create nuisances or distractions for traffic.

3.4 FLARES AND LIGHTS

A. During periods of low visibility provide temporary flares and lights for the following:
   1. To clearly delineate traffic lanes, to guide traffic, and to warn of hazardous areas.
   2. For use by traffic control personnel directing traffic.

B. Provide adequate illumination of critical traffic and parking areas.

3.5 PARKING CONTROL

A. Control CONTRACTOR-related vehicular parking at the Site to preclude interfering with: traffic and parking, access by emergency vehicles, CITY's operations, and construction operations. CITY will provide temporary parking facilities for the public, as required because of construction operations.

B. Control parking of construction and private vehicles at the Site as follows:
   1. Maintain free vehicular access to and through parking areas.
   2. Prohibit parking on or adjacent to access roads, and in non-designated areas.
   3. Construction vehicles shall possess current vehicle registration.
   4. Private vehicles shall park only in designated areas.
   5. Park offsite and carpool CONTRACTOR's employees.

3.6 HAUL ROUTES

A. Consult with authorities having jurisdiction to establish thoroughfares that will be used as haul routes and Site access.

B. Confine construction traffic to designated haul routes.

C. Provide temporary traffic controls at critical areas of haul routes to expedite traffic flow, and to minimize interference with normal traffic.

3.7 REMOVAL

A. Maintain and protect traffic until Substantial Completion and at all times thereafter when CONTRACTOR is working at the Site. Provide maintenance and protection of traffic measures at the Site until no longer required due to the progress of the Work. When no longer required, completely remove maintenance and protection of traffic measures and restore the Site to condition required by the Contract Documents or, when not indicated in the Contract Documents, to pre-construction conditions.

+ + END OF SECTION + +

SECTION 01 57 05

TEMPORARY CONTROLS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide and maintain methods, materials, equipment, and temporary construction as required for controlling environmental conditions at the Site and adjacent areas during construction.
   2. Maintain controls until no longer required. Provide temporary controls at all times when CONTRACTOR is working at the Site.
   3. Temporary controls provided by each prime CONTRACTOR include, but are not limited to, the following:
      a. Noise controls.
      b. Pollution controls.
   4. Temporary controls provided by general CONTRACTOR include, but are not limited to, the following:
      a. Erosion and sediment controls.
      b. Dust controls.
      c. Pest and rodent controls.
      d. Control of water, including storm water runoff.

B. Related Sections:
   1. Section 01 35 44, Spill Prevention Control and Countermeasures Plan.

1.2 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with applicable provisions and recommendations of the following:
   1. New York State Department of Environmental Conservation.

1.3 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Plan for construction staging and maintenance of the Site relative to erosion and sediment controls. Indicate on a site plan approximate areas of planned disturbance of soils and soil cove over time during the Project. For areas not indicated in the Contract Documents as being disturbed and that CONTRACTOR proposes to disturb, Shop Drawing shall include proposed erosion and sediment control measures for the additional area.
      b. Location and details of temporary settlement basin(s).

2. Product Data:
   a. Silt fencing materials.

B. Informational Submittals: Submit the following:
   1. Procedural Submittals:
      a. Proposed dust control measures, when submittal is requested by ENGINEER.

PART 2 – PRODUCTS

2.1 MATERIALS FOR TEMPORARY EROSION AND SEDIMENT CONTROLS

A. Materials for temporary erosion and sediment controls shall be as shown or indicated on the Drawings.

PART 3 – EXECUTION

3.1 NOISE CONTROL

A. Noise Control – General:
   1. CONTRACTOR's vehicles and equipment shall minimize noise emissions to greatest degree practicable. When necessary, provide mufflers and silencers on construction equipment, and provide temporary sound barriers onsite when necessary.
   2. Noise levels shall comply with Laws and Regulations, including OSHA requirements and local ordinances.
   3. Noise emissions shall not interfere with the work of CITY or others.

3.2 DUST CONTROL

A. Dust Control – General:
   1. Control objectionable dust caused by CONTRACTOR's operation of vehicles and equipment, clearing, demolition, cleaning, and other actions. To minimize airborne dust, apply water or use other methods subject to acceptance of ENGINEER and approval of authorities having jurisdiction.
   2. CONTRACTOR shall prevent blowing and movement of dust from exposed soil surfaces and access roads to reduce onsite and off-Site damage, nuisances, and health hazards associated with dust emissions.

B. Dust Control Methods:
   1. Dust control may be achieved by irrigation in which the dust-prone area of the Site shall be sprinkled with water until the surface is moist.
   2. Apply dust controls as frequently as required without creating nuisances such as excessive mud and ponding of water at the Site. Do not use water for dust

control when water will cause hazardous or objectionable conditions such as ice, mud, ponds, and pollution.

3. Provide dust control that is non-polluting and does not contribute to tracking-out of dirt and dust onto pavement.

C. Removal of Dust and Dirt from Travelled Surfaces:

1. Remove dust and dirt from roadways, drives, parking areas, and other travelled surfaces not less than the frequency indicated in Section 01 74 05, Cleaning.
2. Perform dust and dirt removals from travelled surfaces by mechanical sweeping or other method acceptable to ENGINEER.

3.3 PEST AND RODENT CONTROL

A. Pest and Rodent Control – General:

1. Provide pest and rodent controls as required to prevent infestation of the Site and storage areas.
2. Employ methods and use materials that do not adversely affect conditions at the Site or on adjoining properties.
3. In accordance with Laws and Regulations, promptly and properly dispose of pests and rodents trapped or otherwise controlled.

3.4 WATER CONTROL

A. Water Control – General:

1. Provide methods to control surface water and water from excavations and structures to prevent damage to the Work, the Site, and adjoining properties.
2. Control fill, grading, and ditching to direct water away from excavations, pits, tunnels and other construction areas and to direct drainage to proper runoff courses to prevent erosion, damage, or nuisance. Avoid directing to adjoining properties runoff from the Site and construction operations.

B. Equipment and Facilities for Water Control:

1. Provide, operate, and maintain equipment and facilities of adequate size to control surface water.

C. Discharge and Disposal:

1. Dispose of storm water and ground water in manner to prevent flooding, erosion, and other damage to any and all parts of the Site and adjoining areas, and that complies with Laws and Regulations.

3.5 POLLUTION CONTROL

A. Pollution Control – General:

1. Provide means, methods, and facilities required to prevent contamination of soil, water, and atmosphere caused by discharge of noxious substances from or caused by construction operations.

2. Equipment used during construction shall comply with Laws and Regulations.
3. Comply with Section 01 35 43.13, Environmental Procedures for Hazardous Materials.

B. Spills and Contamination:
1. Provide equipment and personnel to perform emergency measures required to contain spills and to remove contaminated soils and liquids.
2. Excavate contaminated material and properly dispose of off-Site, and replace with suitable compacted fill and topsoil.
3. Comply with Section 01 35 44, Spill Prevention Control and Countermeasures Plan, and CITY's hazard control procedures as indicated in Section 01 35 23, Safety Requirements.

C. Protection of Surface Waters and Ground Water:
1. Provide and maintain special measures to prevent harmful substances from entering surface waters and ground water. Prevent disposal of wastes, effluents, chemicals, and other such substances in or adjacent to surface waters and open drainage routes, in sanitary sewers, or in storm sewers, and in ground water.

D. Atmospheric Pollutants:
1. Provide and maintain systems for controlling atmospheric pollutants related to the Work.
2. Prevent toxic concentrations of chemicals and vapors.
3. Prevent harmful dispersal of pollutants into atmosphere.

E. Solid Waste:
1. Provide and maintain systems for controlling and managing solid waste related to the Work.
2. Prevent solid waste from becoming airborne, and from discharging to surface waters and drainage routes.
3. Properly handle and dispose of solid waste.
4. Comply with requirements for cleaning and disposal of debris in the General Conditions, as may be modified by the Supplementary Conditions, and Section 01 74 05, Cleaning.

3.6 EROSION AND SEDIMENT CONTROLS

A. Installation and Maintenance of Erosion and Sediment Controls – General:
1. General:
a. Provide temporary erosion and sediment controls as shown and indicated on the Drawings and as indicated elsewhere in the Contract Documents. Provide erosion and sediment controls as the Work progresses into previously-undisturbed areas.
b. Installation of erosion and sediment controls shall be in accordance with the applicable regulatory requirements indicated in Article 1.2 of this

Section, unless more-stringent methods are otherwise shown or indicated in the Contract Documents.

c. Use necessary methods to successfully control erosion and sedimentation, including ecology-oriented construction practices, vegetative measures, and mechanical controls. Use best management practices (BMP) in accordance with Laws and Regulations, and regulatory requirements indicated in Article 1.2 of this Section, to control erosion and sedimentation during the Project.

d. Plan and execute construction, disturbances of soils and soil cover, and earthwork by methods to control surface drainage from cuts and fills, and from borrow and waste disposal areas, to prevent erosion and sedimentation. Provide temporary measures for controlling erosion and sedimentation, as indicated in the Contract Documents and as required for the Project.

e. Where areas must be cleared for storage of materials or equipment, or for temporary facilities, provide measures for regulating drainage and controlling erosion and sedimentation, subject to the ENGINEER'S approval.

f. Provide erosion and sediment controls, including stabilization of soils, at the end of each workday.

2. Coordination:

a. Coordinate temporary erosion and sediment controls with construction of permanent drainage facilities and other Work to the extent necessary for economical, effective, and continuous erosion and sediment controls.

3. Before commencing activities that will disturb soil or soil cover at the Site, provide all erosion and sediment control measures required by the Contract Documents for the areas where soil or soil cover will be disturbed.

4. In general, implement construction procedures associated with, or that may affect, erosion and sediment control to ensure minimum damage to the environment during construction.

5. Vegetation Removal: Remove only those shrubs, grasses, and other vegetation that must be removed for construction. Protect remaining vegetation.

6. Access Roads and Parking Areas: When possible, access roads and temporary roads and parking shall be located and constructed to avoid adverse effects on the environment. Provide measures to regulate drainage, avoid erosion and sedimentation, and minimize damage to vegetation.

7. Earthwork and Temporary Controls:

a. Perform excavation, fill, and related operations in accordance with Section 31 23 05, Excavation and Fill.

b. Control erosion to minimize transport of silt from the Site into existing waterways and surface waters. Such measures shall include, but are not limited to, using berms, silt fencing, baled straw silt barriers, gravel or crushed stone, mulching and soil stabilization, slope drains, and other methods. Apply such temporary measures to erodible materials exposed by activities associated with the construction of the Project.

c. Hold to a minimum the areas of bare soil exposed at one time.

d. Construct fills and waste areas by selectively placing fill and waste materials to eliminate surface silts and clays that will erode.
e. In performing earthwork, eliminate depressions that could serve as mosquito breeding pools.
f. CONTRACTOR shall provide special care in areas with steep slopes, where disturbance of vegetation shall be minimized to maintain soil stability.

8. Inspection and Maintenance:
   a. Periodically inspect areas of earthwork and areas where soil or soil cover are disturbed to detect evidence of the start of erosion and sedimentation; promptly implement corrective measures as required to control erosion and sedimentation. Continue inspections and corrective measures until soils are permanently stabilized and permanent vegetation has been established
   b. Inspect, at a minimum, once per week and after each precipitation event.
   c. Repair or replace damaged erosion and sediment controls within 24 hours of CONTRACTOR becoming aware of such damage.
   d. Periodically remove silt and sediment that has accumulated in or behind sediment and erosion controls. Properly dispose of silt and sediment.
9. Duration of Erosion and Sediment Controls:
   a. Maintain erosion and sediment controls in effective working condition until the associated drainage area has been permanently stabilized.
   b. Maintain erosion and sediment controls until the Site is restored and site improvements including landscaping, if any, are complete with underlying soils permanently stabilized.
10. Work Stoppage:
   a. If the Work is temporarily stopped or suspended for any reason, CONTRACTOR shall provide additional temporary controls necessary to prevent environmental damage to the Site and adjacent areas while the Work is stopped or suspended.
11. Failure to Provide Adequate Controls:
   a. In the event CONTRACTOR repeatedly fails to satisfactorily control erosion and sedimentation, DEPARTMENT reserves the right to employ outside assistance or to use DEPARTMENT's own forces for erosion and sediment control.
   b. Cost of such work by DEPARTMENT, plus engineering and inspection costs, will be deducted from amounts due CONTRACTOR, as set-offs in accordance with the Contract Documents.

3.7 REMOVAL OF TEMPORARY CONTROLS

A. Removals – General:
   1. After soils are permanently stabilized, remove from the Site temporary erosion and sediment controls.

+ + END OF SECTION + +

SECTION 01 57 33

SECURITY

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes general requirements for security at the Site, including accessing the Site, securing the Work, temporary fencing, and other requirements to be provided by the general CONTRACTOR.
   2. CONTRACTOR shall safely guard all the Work, the Project, materials, equipment, and property from loss, theft, damage, and vandalism until Substantial Completion, unless otherwise agreed upon by the parties.
   3. CONTRACTOR's duty includes safely guarding CITY's property in vicinity of the Work and Project, and other private property in the vicinity of the Project from injury and loss in connection with performance of the Project.
   4. Make no claim against DEPARTMENT or CITY for damage resulting from trespass.
   5. Remedy damage to property of CITY and others arising from failure to furnish adequate security.
   6. Provide temporary fencing in accordance with the Contract Documents.
   7. CONTRACTOR's security measures shall be at least equal to those usually provided by CITY to protect existing facilities during normal operation.

1.2 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Temporary Fencing: Submit site plan drawings showing proposed locations and extent of temporary site security fencing and each breach therein.
   2. Product Data:
      a. Temporary Fencing: Manufacturer's literature, specifications, and installation instructions for temporary site security fencing proposed.

1.3 CONTRACTOR'S SITE ACCESS AND SECURITY PROCEDURES

A. Comply with Section 01 55 13, Access Roads and Parking Areas.

PART 2 – PRODUCTS

2.1 TEMPORARY FENCING

A. When security fencing or barriers are breached or temporarily removed for the Project, provide and maintain temporary security fencing equal to existing, unless otherwise specified, in manner satisfactory to ENGINEER and CITY.

PART 3 – EXECUTION

3.1 TEMPORARY FENCING

A. Installation:
   1. Provide temporary fencing for site security so that integrity of site security is maintained throughout the Project.
   2. Install temporary fencing used for site security in accordance with the Contract Documents and fence manufacturer's instructions.

B. Maintenance:
   1. Maintain temporary fencing throughout the Project.
   2. Repair damage to temporary fencing and replace fencing when required to preserve Site security.

C. Removal:
   1. Remove temporary fencing when permanent site security fencing is in place and fully functional, or when otherwise directed or ENGINEER.

+ + END OF SECTION + +

SECTION 01 61 00

COMMON PRODUCT REQUIREMENTS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes:
      a. Common requirements for materials and equipment.
      b. Compatibility of materials and equipment.

1.2 REQUIREMENTS FOR MATERIALS AND EQUIPMENT

A. Unless otherwise indicated in the Contract Documents, furnish materials and equipment that:
   1. have not been previously been incorporated into another project or facility; and
   2. have not changed ownership after initial shipment from the manufacturer's factory or facility; and
   3. if stored since their manufacture or fabrication, have, while in storage, been properly maintained and serviced in accordance with the manufacturer's recommendations for long-term storage; submit documentation as required by ENGINEER that such maintenance and service has been performed; and
   4. that the item(s) have not been subject to degradation or deterioration since manufacture; and
   5. are the current model(s) or type(s) furnished by the Supplier.

B. To the extent possible, furnish from a single source those materials and equipment that are of the same generic kind.

C. Furnish materials and equipment complete with accessories, trim, finish, fasteners, and other items shown, indicated, or required for a complete installation for the indicated use and performance.

D. Standard Items: When available, and unless custom or nonstandard options are specified or indicated, furnish standard materials and equipment of types that have been produced and used successfully in similar situations on other projects.

E. Visual Matching: Where required in the Contract Documents, furnish materials and equipment that match (as determined by ENGINEER) referenced existing construction, and mock-ups and Sample(s) approved by ENGINEER.

F. Where the Contract Documents include the phrase "as selected" for color of materials or equipment, finish pattern, option, or similar phrase, provide materials and equipment selected by ENGINEER as follows:
   1. Standard Range: Where the Contract Documents include the phrase "standard range of colors, patterns, textures" or similar wording, provide color, pattern, density, or texture selected by ENGINEER from manufacturer's product line that does not include premium items.
   2. Full Range: Where the Contract Documents include the phrase "full range of colors, patterns, textures" or similar wording, ENGINEER will select color, pattern, density, or texture from manufacturer's entire product line, including standard and premium items.

1.3 COMPATIBILITY

A. Similar materials and equipment by the same Supplier shall be compatible with each other, unless otherwise indicated in the Contract Documents or approved by ENGINEER.

B. Provide materials and equipment compatible with items previously selected or installed on the Project.
   1. Provide materials and equipment and employ construction methods compatible with materials and equipment and construction methods of other contractors' construction of similar or associated work.
   2. If disagreement arises between contractors over concurrently-selectable but incompatible materials or equipment, ENGINEER will determine items to be used in accordance with the Contract Documents.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 62 00

PRODUCT OPTIONS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes:
      a. CONTRACTOR's options for selecting materials and equipment.
      b. Requirements for consideration of "or-equal" materials and equipment.

1.2 PRODUCT OPTIONS

A. For materials and equipment specified only by reference standard or description, without reference to Supplier, furnish materials and equipment complying with such standard, by a Supplier or from a source that complies with the Contract Documents.

B. For materials and equipment specified by naming one or more items or Suppliers, furnish the named materials and equipment that comply with the Contract Documents, unless an "or-equal" or substitute item is approved by ENGINEER.

C. For materials and equipment specified by naming one or more items or Suppliers and the term, "or-equal", when CONTRACTOR proposes a material or equipment item or Supplier as an "or-equal", submit to ENGINEER a request for approval of an "or-equal" item or Supplier.

D. For materials and equipment specified by naming only one item or manufacturer and followed by words indicating that no substitution is allowed, there is no option and no "or-equals" or substitution will be allowed or approved.

1.3 "OR-EQUAL" ITEMS

A. Procedure:
   1. For proposed materials and equipment not named in the Contract Documents and considered as an "or-equal" in accordance with the General Conditions, CONTRACTOR shall request in writing ENGINEER's approval of the "or-equal".
   2. Request for approval of an "or-equal" item shall accompany the Shop Drawing or product data submittal for the proposed item

B. Requests for approval of "or-equals" shall include:
   1. CONTRACTOR's written request that the proposed item be considered as an "or-equal" in accordance with the General Conditions, accompanied by CONTRACTOR's certifications required in the General Conditions.
   2. Documentation adequate to demonstrate to ENGINEER that proposed item does not require extensive revisions to the Contract Documents, that proposed item is consistent with the Contract Documents, and that proposed item will produce results and performance required in the Contract Documents, and that proposed item is compatible with other portions of the Work.
   3. Detailed comparison of significant qualities of proposed item with the materials and equipment and manufacturers named in the Contract Documents. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements shown or indicated.
   4. Evidence that proposed item's manufacturer will furnish warranty equal to or better than that specified, if any.
   5. List of similar installations for completed projects with project names and addresses, and names and address of design professionals and owners, when requested.
   6. Samples, when requested by ENGINEER.
   7. Other information requested by ENGINEER.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 64 00

DEPARTMENT FURNISHED PRODUCTS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes requirements and procedures for DEPARTMENT furnished materials and equipment to be installed by CONTRACTOR.
   2. General CONTRACTOR shall provide labor, materials, tools, equipment, and incidentals shown, specified, and required for accepting, handling, storing as required, installing, checking out and starting-up, and completing DEPARTMENT furnished materials and equipment.

B. Coordination:
   1. Review installation procedures for DEPARTMENT furnished materials and equipment and coordinate installation of items to be installed with or before DEPARTMENT furnished materials and equipment.
   2. Notify other contractors in advance of installing DEPARTMENT furnished materials and equipment to provide other contractors with sufficient time for installing items included in their contracts to be installed with or before DEPARTMENT furnished materials and equipment.

C. Scheduling:
   1. Schedule and perform the Work to coordinate with anticipated delivery dates for DEPARTMENT furnished materials and equipment, as indicated in DEPARTMENT's procurement contracts or purchase orders therefor.
   2. Where DEPARTMENT will furnish services of a manufacturer's representative for DEPARTMENT furnished materials and equipment, schedule and perform the Work in accordance with scheduling constraints of manufacturer's representative.
   3. Comply with the Contract Times indicated in the Agreement and Section 01 33 13, Milestones.

1.2 DEPARTMENT FURNISHED MATERIALS AND EQUIPMENT

A. Items of equipment and materials to be furnished by DEPARTMENT for installation by CONTRACTOR are:
   1. Granular activated carbon (GAC) contactor systems and appurtenances.
   2. Granular activated carbon (GAC) media.

B. Delivery:
   1. Materials and equipment indicated in Paragraph 1.2.A of this Section will be delivered to the site.
   2. The first set of DEPARTMENT furnished GAC contactor systems will be available to CONTRACTOR starting on March 13, 2017 or a date thereafter as coordinated with the CONTRACTOR, and as required thereafter to maintain the Progress Schedule accepted by ENGINEER. Refer to Section 01 33 13, Milestones.
   3. DEPARTMENT furnished GAC media will be available to CONTRACTOR starting on May 1, 2017 or a date thereafter as coordinated with the CONTRACTOR, and as required thereafter to maintain the Progress Schedule accepted by ENGINEER. Refer to Section 01 33 13, Milestones. Delivery of DEPARTMENT furnished GAC media is limited to two 20,000 pound loads per day. Each DEPARTMENT furnished GAC Contactor requires 40,000 pounds of GAC media. CONTRACTOR's construction shall contain sufficient time to account for filling, flushing and testing DEPARTMENT furnished GAC Contactors and GAC media.

C. Availability of Procurement Documents:
   1. Copies of the procurement contract documents, as available, under which materials and equipment were procured by DEPARTMENT (as "buyer") are distributed with each copy of, but are not part of, the Bidding Documents.
   2. After the Effective Date of the Contract, copies of the procurement contract documents will be furnished to CONTRACTOR upon request without cost.

D. DEPARTMENT's Responsibilities:
   1. Within ten days of the Effective Date of the Contract, arrange for and deliver to General CONTRACTOR a compact disc containing electronic files in portable document format (PDF) of each of seller's shop drawings, samples, and other submittals as reviewed by DEPARTMENT or ENGINEER (as applicable), including seller's installation drawings.
   2. DEPARTMENT shall arrange and pay for delivery to Site of DEPARTMENT furnished materials and equipment.
   3. Upon delivery, DEPARTMENT and/or ENGINEER shall inspect, jointly with General CONTRACTOR, the materials and equipment delivered. Where appropriate, DEPARTMENT will arrange with seller to have seller's representative present at the delivery point to assist in inspecting the materials and equipment delivered.
   4. DEPARTMENT will submit to seller claims for transportation damage and shall replace damaged, defective, or deficient items of DEPARTMENT furnished materials and equipment.
   5. DEPARTMENT shall pay for services of seller's factory-trained representative to furnish consultation and advice during the installation of the DEPARTMENT furnished materials and equipment, to inspect, check, and approve installation before operation, and to furnish technical advice and direction during start-up and field testing of the DEPARTMENT furnished

materials and equipment. Extent to which services of seller's representative will be provided during installation will be in accordance with the procurement contract documents unless determined otherwise by DEPARTMENT.

6. DEPARTMENT shall arrange for manufacturers' warranties, inspections, and services relative to DEPARTMENT furnished materials and equipment.

F. General CONTRACTOR's Responsibilities:

1. Responsibilities for DEPARTMENT furnished materials and equipment delivered to the Site will begin upon CONTRACTOR's commencing to unload and handle DEPARTMENT furnished materials and equipment at that location.
2. Receive and unload at the Site DEPARTMENT furnished materials and equipment. Provide labor, materials, equipment, tools, and incidentals for unloading. Perform unloading promptly. Pay all charges for demurrage due to negligence or delay by CONTRACTOR.
3. Inspect for completeness or damage, jointly with DEPARTMENT and/or ENGINEER, and reject defective items. DEPARTMENT reserves the right to accept DEPARTMENT furnished items rejected by CONTRACTOR and to authorize their use in the Work.
4. Indicate to DEPARTMENT signed acceptance of delivery on copy of shipping invoice.
5. Where property insurance for the Contract is furnished by CONTRACTOR, increase the amount of property insurance to be not less than that indicated in the Contract Documents plus the replacement value of DEPARTMENT furnished materials and equipment as indicated in the property insurance requirements in the Supplementary Conditions. Furnish to DEPARTMENT copies of evidence of such revised property insurance coverage amounts.
6. Handle, store, and maintain DEPARTMENT furnished materials and equipment.
7. Repair or replace DEPARTMENT furnished materials and equipment that are missing, lost, or damaged after receipt by CONTRACTOR. Replacements shall be in accordance with DEPARTMENT's procurement contract documents.
8. Coordinate with seller's shop drawings, samples, and other submittals, including seller's installation drawings, reviewed and approved by DEPARTMENT or ENGINEER, as applicable.
9. Install, connect, and start up DEPARTMENT furnished materials and equipment in accordance with manufacturer's instructions, unless otherwise specified.

1.3 ASSIGNED PROCUREMENT CONTRACTS

A. Contracts for procurement of materials and equipment described in this paragraph are assigned to the Contract(s) designed below, in accordance with the Agreement.

1. None.

1.4 HANDLING AND STORAGE

A. Handling:
   1. Handle DEPARTMENT furnished materials and equipment in accordance with the Contract Documents and the manufacturer's instructions.

B. Storage:
   1. Store DEPARTMENT furnished materials and equipment in accordance with the Contract Documents and the manufacturer's instructions.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 65 00

PRODUCT DELIVERY REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes general requirements for preparing for shipping, delivering, and handling materials and equipment to be incorporated into the Work.
   2. CONTRACTOR shall make all arrangements for transporting, delivering, and handling of materials and equipment required for prosecution and completion of the Work.
   3. When required, move stored materials and equipment without changes to the Contract Price or Contract Times.

1.2 SUBMITTALS

A. Refer to individual Specifications Sections for submittal requirements relative to delivering and handling materials and equipment.

1.3 PREPARING FOR SHIPMENT

A. When practical, factory-assemble materials and equipment. Mark or tag separate parts and assemblies to facilitate field-assembly. Cover machined and unpainted parts that may be damaged by the elements or climate with strippable, protective coating.

B. Package materials and equipment to facilitate handling, and protect materials and equipment from damage during shipping, handling, and storage. Mark or tag outside of each package and crate to indicate the associated purchase order number, bill of lading number, contents by name, DEPARTMENT's contract designation, CONTRACTOR name, equipment number, and approximate weight. Include complete packing lists and bills of materials with each shipment.

C. Protect materials and equipment from exposure to the elements and damage by climate, and keep thoroughly dry and dust-free at all times. Protect painted surfaces against impact, abrasion, discoloration, and other damage. Lubricate bearings and other items requiring lubrication in accordance with manufacturer's instructions.

D. Advance Notification of Shipments:

1. Keep ENGINEER informed of delivery of all materials and equipment to be incorporated in the Work.

E. Do not ship materials and equipment until:
   1. Related Shop Drawings, Samples, and other submittals required by the Contract Documents have been approved or accepted (as applicable) by ENGINEER, including, but not necessarily limited to, all Action Submittals associated with the materials and equipment being delivered.
   2. Manufacturer's instructions for handling, storing, and installing the associated materials and equipment have been submitted to and accepted by ENGINEER in accordance with the Specifications.
   3. Results of source quality control testing (factory testing), when required by the Contract Documents for the associated materials or equipment, have been submitted to and accepted by ENGINEER.
   4. Facilities required for handling materials and equipment in accordance with the Contract Documents and manufacturer's instructions are in place and available.
   5. Required storage facilities have been provided.

1.4 DELIVERY

A. Scheduling and Timing of Deliveries:
   1. Arrange deliveries of materials and equipment in accordance with the Progress Schedule accepted by ENGINEER and in ample time to facilitate inspection and observation prior to installation.
   2. Schedule deliveries to minimize space required for and duration of storage of materials and equipment at the Site or other delivery location, as applicable.
   3. Coordinate deliveries to avoid conflicting with the Work and conditions at Site, and to accommodate the following:
      a. Work of other contractors and CITY.
      b. Storage space limitations.
      c. Availability of equipment and personnel for handling materials and equipment.
      d. CITY's use of premises.
   4. Deliver materials and equipment to the Site during regular working hours.
   5. Deliver materials and equipment to avoid delaying the Work and the Project, including work of other contractors, as applicable. Deliver anchor system materials, including anchor bolts to be embedded in concrete or masonry, in ample time to avoid delaying the Work.

B. Deliveries:
   1. Shipments shall be delivered with CONTRACTOR's name, Subcontractor's name (if applicable), Site name, Project name, and contract designation (example: "ABC Construction Co., City of Newburgh, New York, GAC

Treatment System at Washington Lake Filtration Plant, Contract No. D010308, General Construction") clearly marked.

2. Site may be listed as the "ship to" or "delivery" address; but CITY shall not be listed as recipient of shipment unless otherwise directed in writing by ENGINEER.
3. Provide CONTRACTOR's telephone number to shipper; do not provide CITY's telephone number.
4. Arrange for deliveries while CONTRACTOR's personnel are at the Site. CONTRACTOR shall receive and coordinate shipments upon delivery. Shipments delivered to the Site when CONTRACTOR is not present will be refused by CITY, and CONTRACTOR shall be responsible for the associated delays and additional costs, if incurred.
5. Comply with Section 01 35 43.13, Environmental Procedures for Hazardous Materials.

C. Containers and Marking:
1. Have materials and equipment delivered in manufacturer's original, unopened, labeled containers.
2. Clearly mark partial deliveries of component parts of materials and equipment to identify materials and equipment, to allow easy accumulation of parts, and to facilitate assembly.

D. Inspection of Deliveries:
1. Immediately upon delivery, inspect shipment to verify that:
   a. Materials and equipment comply with the Contract Documents and approved or accepted (as applicable) submittals.
   b. Quantities are correct.
   c. Materials and equipment are undamaged and of the required quality.
   d. Containers and packages are intact and labels are legible.
   e. Materials and equipment are properly protected.
2. Promptly remove damaged materials and equipment from the Site and expedite delivery of new, undamaged materials and equipment, and remedy incomplete or lost materials and equipment. Furnish materials and equipment in accordance with the Contract Documents, to avoid delaying progress of the Work.
3. Advise ENGINEER in writing when damaged, incomplete, or defective materials and equipment are delivered, and advise ENGINEER of the associated impact on the Progress Schedule.

1.5 HANDLING OF MATERIALS AND EQUIPMENT

A. Provide equipment and personnel necessary to handle materials and equipment, including DEPARTMENT furnished equipment, by methods that prevent soiling or damaging materials and equipment and packaging.

B. Provide additional protection during handling as necessary to prevent scraping, marring, and otherwise damaging materials and equipment and surrounding surfaces.

C. Handle materials and equipment by methods that prevent bending and overstressing.

D. Lift heavy components only at designated lifting points.

E. Handle materials and equipment in safe manner and as recommended by the manufacturer to prevent damage. Do not drop, roll, or skid materials and equipment off delivery vehicles or at other times during handling. Hand-carry or use suitable handling equipment.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 66 00

PRODUCT STORAGE AND HANDLING REQUIREMENTS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes general requirements for storing and protecting materials and equipment.
   2. CONTRACTOR shall provide all labor, materials, tools, equipment, and incidentals to store and handle materials and equipment to be incorporated into the Work, and other materials and equipment at the Site.

1.2 STORAGE

A. Store and protect materials and equipment in accordance with manufacturer's recommendations and the Contract Documents.

B. General:
   1. CONTRACTOR shall make all arrangements and provisions necessary for, and pay all costs for, storing materials and equipment.
   2. Excavated materials, construction equipment, and materials and equipment to be incorporated into the Work shall be placed to avoid injuring the Work and existing facilities and property, and so that free access is maintained at all times to all parts of the Work and to public utility installations in vicinity of the Work.
   3. Store materials and equipment neatly and compactly in locations that cause minimum inconvenience to CITY, other contractors, public travel, and owners, tenants, and occupants of adjoining property.
   4. Arrange storage in manner to allow easy access for inspection by ENGINEER and Resident Project Representative (RPR).

C. Storage Location:
   1. Areas available at the Site for storing materials and equipment are shown or indicated in the Contract Documents, or as acceptable to ENGINEER.
   2. Restrictions:
      a Do not store materials or equipment in structures being constructed unless approved by ENGINEER in writing.
      b. Do not use lawns or other private property for storage without written permission of the owner or other person in possession or control of such premises.

D. Protection of Stored Materials:
   1. Store materials and equipment to become CITY's property to ensure preservation of quality and fitness of the Work, including proper protection against damage by freezing, moisture, and with outdoor ambient air high temperatures as high as 100 degrees F; temperature and humidity inside crates, containers, storage sheds, and packaging may be significantly higher than the outdoor ambient air temperature.
   2. Store in indoor, climate-controlled storage areas all materials and equipment subject to damage by moisture, humidity, heat, cold, and other elements, unless otherwise acceptable to CITY or DEPARTMENT.
   3. When placing orders to Suppliers for equipment and controls containing computer chips, electronics, and solid-state devices, CONTRACTOR shall obtain, coordinate, and comply with specific temperature and humidity limitations on materials and equipment, because temperature inside cabinets and components stored in warm temperatures can approach 200 degrees F.
   4. CONTRACTOR shall be fully responsible for loss or damage (including theft) to stored materials and equipment.
   5. Do not open manufacturer's containers until time of installation, unless recommended by the manufacturer or otherwise specified in the Contract Documents.
   6. Comply with requirements of Article 1.3 of this Section.

1.3 PROTECTION – GENERAL

A. Equipment to be incorporated into the Work shall be boxed, crated, or otherwise completely enclosed and protected during shipping, handling, and storage, in accordance with Section 01 65 00, Product Delivery Requirements.

B. Store all materials and equipment off the ground (or floor) on raised supports such as skids or pallets.

C. Protect painted surfaces against impact, abrasion, discoloration, and other damage. Painted equipment surfaces that are damaged or marred shall be repainted in their entirety in accordance with equipment manufacturer and paint manufacturer requirements, to the satisfaction of ENGINEER.

D. Protect electrical equipment, controls, and instrumentation against moisture, water damage, humidity, heat, cold, and dust. Space heaters provided in equipment shall be connected and operating at all times until equipment is placed in operation and permanently connected.

1.4 UNCOVERED STORAGE

A. The following types of materials may be stored outdoors without cover on supports so there is no contact with the ground:
   1. Reinforcing steel.

2. Precast concrete materials.
3. Structural steel.
4. Metal stairs.
5. Handrails and railings.
6 Grating.
7. Checker plate.
8. Metal access hatches.
9. Castings.
10. Fiberglass items.
11. Rigid electrical conduit, except PVC-coated conduit.
12. Piping, except PVC or chlorinated PVC (CPVC) pipe.

1.5 COVERED STORAGE

A. The following materials and equipment may be stored outdoors on supports and completely covered with covering impervious to water:
   1. Grout and mortar materials.
   2. Rough lumber.
   3. Soil materials and granular materials such as aggregate.
   4. PVC and CPVC pipe.
   5. PVC-coated electrical conduit.

B. Tie down covers with rope, and install covering properly sloped to prevent accumulation of water.

C. Store loose granular materials, with covering impervious to water, in well-drained area or on solid surfaces to prevent mixing with foreign matter.

1.6 FULLY PROTECTED STORAGE

A. Store all material and equipment not indicated in Articles 1.4 and 1.5 of this Section on supports in buildings or trailers that have concrete or wooden flooring, roof, and fully-closed walls on all sides. Covering with visquine plastic sheeting or similar material in space without floor, roof, and walls is unacceptable. Comply with the following:
   1. Provide heated storage for materials and equipment that could be damaged by low temperatures or freezing.
   2. Provide air-conditioned storage for materials and equipment that could be damaged by high temperatures or humidity.
   3. Protect mechanical and electrical equipment from being contaminated by dust, dirt, and moisture.
   4. Maintain humidity at levels recommended by manufacturers for electrical and electronic equipment.

1.7 HAZARDOUS MATERIALS AND EQUIPMENT

A. Prevent contamination of personnel, storage areas, and the Site. Comply with Laws and Regulations, manufacturer's instructions, Section 01 35 43.13, Environmental Procedures for Hazardous Materials, and other provisions of the Contract Documents.

1.8 MAINTENANCE OF STORAGE

A. On a scheduled basis, periodically inspect stored materials and equipment to ensure that:
   1. Condition and status of storage facilities is adequate to provide required storage conditions.
   2. Required environmental conditions are maintained on continuing basis.
   3. Materials and equipment exposed to elements are not adversely affected.

1.9 MICROPROCESSORS, PANELS, AND INSTRUMENTATION STORAGE

A. Store control panels, microprocessor-based equipment, electronics, and other devices subject to damage or decreased useful life because of temperatures below 40 degrees F or above 100 degrees F, relative humidity above 90 percent, or exposure to rain or exposure to blowing dust in climate-controlled storage space.

B. General:
   1. Storage shall be at location as approved by the ENGINEER.
   2. DEPARTMENT and ENGINEER have the right to observe or inspect materials and equipment during normal working hours.
   3. Place inside each control panel or device a desiccant, volatile corrosion inhibitor blocks (VCI), moisture indicator, and maximum-minimum indicating thermometer.
   4. Check panels and equipment not less than once per month. Replace desiccant, VCI, and moisture indicator as often as required, or every six months, whichever occurs first.
   5. Certified record of daily maximum and minimum temperature and humidity in storage facility shall be available for inspection by DEPARTMENT and ENGINEER. Certified record of monthly inspection, noting maximum and minimum temperature for month, condition of desiccant, VCI, and moisture indicator, shall be made available to DEPARTMENT and ENGINEER upon request.

C. Costs for storing climate-sensitive materials and equipment shall be paid by CONTRACTOR. Replace panels and devices damaged during storage, or for which storage temperatures or humidity range has been exceeded, at no additional cost to DEPARTMENT. Delays resulting from such replacement are causes within CONTRACTOR's control.

D. Do not ship control panels and equipment to the Site until conditions at the Site are suitable for installation, including slabs and floors, walls, roofs, and environmental controls. Failure to have the Site ready for installation shall not relieve CONTRACTOR from complying with the Contract Documents.

1.10 RECORDS

A. Keep up-to-date account of materials and equipment in storage to facilitate preparation of Applications for Payment, if the Contract Documents provide for payment for materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

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SECTION 01 71 23

FIELD ENGINEERING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes field engineering, surveying, and layouts by general CONTRACTOR, and associated requirements. This Section supplements the General Conditions' provisions on reference points and other matters.
   2. CONTRACTOR shall provide field engineering services, surveying and layout services, and professional services of the types indicated for the Project, including:
      a. Furnishing civil, structural, and other professional engineering services specified or required to execute CONTRACTOR's construction methods.
      b. Developing and making all detail surveys and measurements required for construction; including slope stakes, batter boards, and all other working lines, elevations, and cut sheets.
      c. Providing materials required for benchmarks, control points, batter boards, grade stakes, structure and pipeline elevation stakes, and other items.
      d. Keeping a transit, theodolite, or total station (i.e., theodolite with electronic distance measurement device); leveling instrument; and related implements such as survey rods and other measurement devices, at the Site at all times, and having a skilled instrument person available when necessary for laying out the Work.
      e. Being solely responsible for all locations, dimensions and levels. No data other than Change Order, Work Change Directive, or Field Order shall justify departure from dimensions and levels required by the Contract Documents.
      f. Rectifying all Work improperly installed because of not maintaining, not protecting, or removing without authorization established reference points, stakes, marks, and monuments.
      g. Providing such facilities and assistance necessary for ENGINEER and Resident Project Representative (if any) or DEPARTMENT's Site Representative (if any) to check lines and grade points placed by CONTRACTOR. Do not perform excavation or embankment work until all cross-sectioning necessary for determining payment quantities for Unit Price Work have been completed and accepted by ENGINEER.

B. Coordination:
   1. Review requirements of this and other Sections and coordinate installation of items to be installed with or before field engineering, surveying, and layout Work.

1.2 SUBMITTALS

A. Informational Submittals: Submit the following:
   1. Certificates:
      a. When requested by ENGINEER, submit certificate signed by professional engineer or professional surveyor, as applicable, certifying that elevations and locations of the Work comply with the Contract Documents. Explain each deviation, if any.
   2. Field Engineering:
      a. Submit daily reports as indicated in this Section.
      b. When requested by ENGINEER, submit documentation verifying accuracy of field engineering.
   3. Surveying:
      a. Complete plan for performing survey work, submitted not less than 10 days prior to beginning survey Work.
      b. Example of proposed survey field books to be maintained by CONTRACTOR's surveyor. Example shall have sufficient information and detail, including example calculations and notes, to demonstrate that field books will be organized and maintained in a professional manner in accordance with the Contract Documents.
      c. Submit original field books within two days after completing survey Work.
      d. Submit certified survey in accordance with this Section.
   4. Qualifications Statements:
      a. Field Engineer: Name, employer, and professional address. When requested by ENGINEER, submit qualifications, including resume'.
      b. Surveyor: Name, employer, and professional address of firm, and resumes of each professional land surveyor and crew chief that will be engaged in survey Work. Submit not less than 10 days prior to beginning survey Work. During the Project, submit resume for each new registered, licensed land surveyor and crew chief employed by or retained by CONTRACTOR not less than 10 days prior to starting on the survey Work.

1.3 CONTRACTOR'S ENGINEERS

A. Qualifications of Field Engineer:
   1. Employ and retain at the Site a field engineer with experience and capability of performing all field engineering tasks required of CONTRACTOR, as indicated in this Article and elsewhere in the Contract Documents.

2. CONTRACTOR's field engineer shall possess not less than five years of experience performing duties similar in scope and extent to those required of CONTRACTOR's field engineer on this Project.

B. Responsibilities of Contractor's Field Engineer or Site Superintendent:
1. Daily Reports:
   a. Prepare and maintaining daily reports of activity on the Contract. Submit reports to ENGINEER including the following information:
      1) Number of employees at the Site.
      2) Number employees at the Site for each Subcontractor.
      3) Breakdown of employees by trades.
      4) Major equipment and materials installed as part of the Work.
      5) Major construction equipment utilized.
      6) Location of areas in which construction was performed.
      7) Materials and equipment delivered to the Site or suitable, offsite storage location.
      8) Work performed, including field quality control and testing.
      9) Weather conditions.
      10) Safety concerns, events, and precautions taken.
      11) Delays encountered, extent of delay incurred, reasons for the delay, and measures that will be taken to rectify delays encountered.
      12) Acknowledgement of specific instructions received from ENGINEER or DEPARTMENT.
   b. Daily reports shall be signed and dated by responsible member of CONTRACTOR's staff, such as CONTRACTOR's project manager, field engineer, or superintendent, or foreman designated by CONTRACTOR as having authority to sign daily reports.
   c. Submit CONTRACTOR's daily reports in accordance with Section 01 31 26, Electronic Communication Protocols, by 9:00 a.m. the next working day after the day covered in the associated report.
2. Check all formwork, reinforcing, inserts, structural steel, bolts, sleeves, piping, other materials and equipment for compliance with the Contract Documents.
3. Continually inspect the Work to ensure that the quality and quantities required by the Contract Documents are provided.
4. Cooperate as required with ENGINEER and Resident Project Representative (if any) in observing the Work and performing field inspections.
5. Check and coordinate the Work for conflicts and interferences, and immediately advise ENGINEER and Resident Project Representative, if any, of all discrepancies of which CONTRACTOR is aware.
6. Maintain field office files and drawings, record documents, and coordinate field engineering services with Subcontractors and Suppliers as appropriate, and other prime contractors (if any).
7. Prepare layout and coordination drawings for construction operations.
8. Review and coordinate the Work with Shop Drawings and CONTRACTOR's other submittals approved or accepted, as applicable, by ENGINEER.

C. Professionals Retained by Contractor (whether or not stationed at the Site):
   1. Delegated Professional Design Services:
      a. Where the Contract Documents require CONTRACTOR to furnish professional engineering or architecture services as delegated professional design, the provisions of the General Conditions regarding delegated professional design services, and the Contract Documents' requirements applicable to the specific delegated professional design, shall apply.
   2. Professional Services that are Not Delegated Professional Design of the Completed Work:
      a. Where the Contract Documents require that CONTRACTOR retain a design professional for to carry out CONTRACTOR's responsibilities for construction means, methods, techniques, sequences and procedures (including temporary construction that will not remain as part of the completed Work), such services shall be performed by a registered professional of the discipline required for specific service on the Project, with valid license in the same jurisdiction as the Site.
      b. DEPARTMENT and ENGINEER shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed by such design professionals.

1.4 CONTRACTOR'S SURVEYOR

A. Qualifications:
   1. Employ or retain the services, as needed, at the Site a surveyor with experience and capability of performing surveying and layout tasks required in the Contract Documents and as required for the Work.
   2. CONTRACTOR's surveyor shall possess not less than five years of experience performing duties similar in scope and extent to those required of CONTRACTOR's surveyor on this Project.

B. Responsibilities of Contractor's Surveyor:
   1. Providing required surveying equipment, including transit, theodolite, or total station; level; stakes; and surveying accessories.
   2. Establishing required lines and grades for constructing all facilities, structures, pipelines, and site improvements, including outdoor electrical equipment and feeders.
   3. Preparing and maintaining professional-quality, accurate, well-organized, legible notes of all measurements and calculations made while surveying and laying out the Work.
   4. Prior to backfilling operations, survey, locate, and record on a copy of the Contract Documents accurate representation of buried Work and Underground Facilities provided and encountered.
   5. Locating on a site plan of the Site the actual location of above-ground Work to be indicated on record documents.
   6. Complying with requirements of the Contract Documents relative to surveying and related Work, including requirements of this Section's Articles 1.5 and 3.1.

1.5 RECORDS

A. Records – General:
   1. Maintain at the Site a complete and accurate log of control and survey Work as such Work progresses.

B. Field Books and Records:
   1. Survey data and records shall be in accordance with recognized professional surveying standards, Laws and Regulations, and prevailing standards of practice in the locality where the Site is located.
   2. Original field notes, computations, and other surveying data shall be recorded by CONTRACTOR's surveyor in CONTRACTOR-furnished hard-bound field books.
   3. Completeness and accuracy of survey Work, and completeness and accuracy of survey records, including field books, shall be responsibility of CONTRACTOR.
   4. Failure to organize and maintain survey records in an appropriate manner that allows reasonable and independent verification of calculations, and to allow identification of elevations, dimensions, and grades of the Work, shall be cause for rejecting the survey records, including field books.
   5. Illegible notes or data, and erasures on any page of field books, are unacceptable. Do not submit copied notes or data. Corrections by ruling or lining out errors will be unacceptable unless initialed by the surveyor. Violation of these requirements may require re-surveying the data questioned by ENGINEER.

C. Survey of Surface Structures:
   1. Upon completion of foundation walls and major site improvements, prepare a survey showing or indicating dimensions, locations, angles and elevations of construction and locations and elevations of Underground Facilities installed and encountered during the Work.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 SURVEYING

A. Reference Points:
   1. Refer the General Conditions, as may be modified by the Supplementary Conditions, for requirements regarding reference points.
   2. DEPARTMENT's established reference points that are damaged or destroyed by CONTRACTOR will be re-established by DEPARTMENT at

CONTRACTOR's expense. DEPARTMENT may deduct from payments owed CONTRACTOR such amounts as set-offs in accordance with the Contract Documents.

3. From DEPARTMENT-established reference points, establish lines, grades, and elevations necessary to control the Work. Obtain measurements required for executing the Work to tolerances specified in the Contract Documents.
4. Establish, place, and replace as required, such additional stakes, markers, and other reference points necessary for control, intermediate checks, and guidance of construction operations.

B. Surveys to Determine Quantities for Payment:
1. For each application for progress payment, perform such surveys and computations necessary to determine quantities of Work performed or placed. Perform surveys necessary for ENGINEER to determine final quantities of Work in place.
2. Notify ENGINEER not less than 24 hours before performing survey services for determining quantities to be included in Application for Payment. Unless waived in writing by ENGINEER, perform quantity surveys in presence of ENGINEER or Resident Project Representative (if any).

C. Construction Surveying: Comply with the following:
1. Alignment Staking: Provide alignment stakes at 50-foot intervals on tangent, and at 25-foot intervals on curves.
2. Slope Staking: Provide slope staking at 50-foot intervals on tangent, and at 25-foot intervals on curves. Re-stake at every ten-foot difference in elevation.
3. Structure: Stake-out structures, including elevations, and check prior to and during construction.
4. Pipelines: Stake-out pipelines including elevations, and check prior to and during construction.
5. Roads, Drives, and Paved Areas: Stake-out roadway, driveway, and paved area elevations at 50-foot intervals on tangent, and at 25-foot intervals on curves.
6. Cross-sections: Provide original, intermediate, and final staking as required, for site work other locations as necessary for quantity surveys.
7. Easement Staking: Provide easement staking at 50-foot intervals on tangent, and at 25-foot intervals on curves. Also provide wooden laths with flagging at maximum intervals of 100 feet.
8. Record Staking: Provide permanent stake at each blind flange and each utility cap provided for future connections. Stakes for record staking shall be material acceptable to ENGINEER.

D. Accuracy:
1. Establish CONTRACTOR's temporary survey references points for CONTRACTOR's use to not greater than second-order accuracy (e.g., 1:10000). Construction staking used as a guide for the Work shall be set at not greater than third-order accuracy (e.g., 1:5000). Basis on which such orders are established shall provide the absolute margin for error specified below.

2. Horizontal accuracy of easement staking shall be plus or minus 0.1 feet. Accuracy of other staking shall be plus or minus 0.04 feet horizontally and plus or minus 0.02 feet vertically.
3. Survey calculations shall include an error analysis sufficient to demonstrate required accuracy.

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SECTION 01 71 33

PROTECTION OF THE WORK AND PROPERTY

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes general requirements for safety and protection that augment the requirements of the Agreement. This Section also includes requirements for barricades and warning signals, and protection of trees and plants, existing structures, floors, roofs, installed items, and landscaping.
   2. CONTRACTOR shall be responsible for taking all precautions, providing all programs, and taking all actions necessary to protect personnel health and safety, and to protect the Work and all public and private property and facilities from damage, as specified in the Agreement, and the Specifications.
   3. To prevent damage, injury, or loss, CONTRACTOR's actions shall include the following:
      a. Provide measures for safety of personnel at the Site, including workers engaged in the Work, delivery personnel, testing and inspection personnel, personnel of authorities having jurisdiction, other visitors to the Site, the public, CITY's personnel, DEPARTMENT, ENGINEER, and Resident Project Representative.
      b. Storing apparatus, materials, supplies, and equipment in an orderly, safe manner that does not unduly interfere with progress of the Work or work of other contractors, utility owners, and owners of transportation rights-of-way.
      c. Providing suitable storage facilities for materials and equipment subject to damage or degradation by exposure to climate, temperature, theft, breakage, or other cause.
      d. Placing upon the Work or any part thereof only loads consistent with the safety and integrity of that portion of the Work and existing construction.
      e. Frequently removing and disposing of refuse, rubbish, scrap materials, and debris caused by CONTRACTOR's operations so that, at all times, the Site is safe, orderly, and workmanlike in appearance.
      f. Providing temporary barricades, fencing, and guard rails around the following: openings, scaffolding, temporary stairs and ramps, around excavations, for elevated walkways, and other areas that may present a fall-hazard or hazard to vehicles.
   4. Do not, except after written consent from proper parties, enter or occupy privately-owned property or premises with personnel, tools, materials or equipment, except on lands and easements provided by DEPARTMENT.
   5. CONTRACTOR has full responsibility for preserving public and private property and facilities on and adjacent to the Site. Direct or indirect damage

done by, or on account of, any act, omission, neglect, or misconduct by CONTRACTOR in executing the Work, shall be remedied by CONTRACTOR, at his expense, to condition equal to that existing before damage was done.

6. DEPARTMENT May Remedy:
    a. Should CONTRACTOR fail to protect and safeguard property and the Work after requests from ENGINEER or DEPARTMENT, DEPARTMENT may implement measures to protect property and the Work.
    b. Cost of such DEPARTMENT-implemented measures shall be paid by CONTRACTOR. DEPARTMENT may deduct from payments due CONTRACTOR such amounts as set-offs in accordance with the Contract Documents.
    c. Such right, however, shall not result in any obligation by DEPARTMENT or ENGINEER to continuously monitor or have responsibility for protection of property and the Work, which responsibility is exclusively CONTRACTOR's.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 BARRICADES AND WARNING SIGNALS

A. Barricades and Warning Signals – General:
    1. Where the Work is performed on or adjacent to roadway, access road or driveway, right-of-way, or public place:
        a. Provide temporary barricades, fences, lights, warning signs, danger signals, watchmen, and take other precautionary measures for protecting persons, property, and the Work.
        b. Use appropriately colored and reflective barricades, or paint barricades accordingly, to be visible at night.
        c. From sunset to sunrise, provide and maintain not less than one temporary light at each barricade.
        d. Erect sufficient barricades to keep vehicles from being driven on or into Work under construction.
        e. Furnish watchmen in sufficient numbers to protect the Work.
    2. Provide temporary barricades to protect personnel and property for Work not in or adjacent to transportation routes and vehicular travel areas, including indoor work, in accordance with Laws and Regulations.
    3. CONTRACTOR's responsibility for maintaining temporary barricades, signs, lights, and for providing watchmen shall continue until the Work is substantially complete in accordance with the Contract Documents, unless other provision for security and protection is agreed to by the parties. After

Substantial Completion, protect Work and property during periods when final Work or corrective Work is underway.

B. Temporary Fencing: Refer to Section 01 57 33, Security.

3.2 TREE AND PLANT PROTECTION

A. Tree and Plant Protection – General:
   1. Protect existing trees, shrubs, and plants on or adjacent to the Site, shown or designated to remain in place, against unnecessary cutting, breaking, damage, or skinning of trunk, branches, bark, and roots.
   2. Do not store materials or equipment or park construction equipment and vehicles within foliage drip lines.
   3. In areas subject to traffic, provide temporary fencing or temporary barricades to protect trees and plants.
   4. Open fires are not allowed onsite.
   5. Within the limits of the Work, water trees and plants that are to remain to maintain their health during construction operations.
   6. Cover exposed roots with burlap, and keep such burlap continuously wet. Cover exposed roots with earth as soon as possible. Protect root systems from mechanical damage and damage by erosion, flooding, runoff, and noxious materials in solution.
   7. If branches or trunks are damaged, prune branches immediately and protect cut or damaged areas with emulsified asphalt compounded specifically for horticultural use, in manner acceptable to ENGINEER.
   8. When directed by ENGINEER, remove and dispose of at location away from the Site damaged trees and plants that die or suffer permanent injury, and replace each damaged tree or plant with specimen of equal or better species and quality.
   9. Coordinate Work in this Article with the following Specifications:
      a. Section 31 11 00, Clearing and Grubbing.

3.3 PROTECTION OF EXISTING STRUCTURES

A. Underground Facilities:
   1. Underground Facilities known to CITY, DEPARTMENT and ENGINEER, except water, gas, sewer, electric, and communications services to individual buildings and properties, are shown. Information shown for Underground Facilities is the best available to DEPARTMENT and ENGINEER but, in accordance with the General Conditions, as may be modified by the Supplementary Conditions, is not guaranteed to be correct or complete.

2. CONTRACTOR shall explore ahead of trenching and excavating Work and shall sufficiently uncover Underground Facilities that will or may interfere with the Work to determine their location, to prevent damage to Underground Facilities, and to prevent service interruption to structures and properties served by Underground Facilities. If CONTRACTOR damages an Underground Facility, CONTRACTOR shall restore it to its pre-construction condition, in accordance with requirements of the owner of the damaged facility and the Contract Documents.
3. Necessary changes in the location of the Work may be directed by ENGINEER to avoid Underground Facilities not shown or indicated on the Contract Documents.
4. If permanent relocation of an existing Underground Facilities is required and is not otherwise shown or indicated in the Contract Documents, CONTRACTOR may be directed in writing to perform the required work. When such relocation Work results in a change in the Contract Price, Contract Times, the associated Contract modification procedures and payment for such Work shall be in accordance with the Contract Documents.

B. Surface Structures:
1. Surface structures are existing buildings, structures, and other facilities at or above ground surface, including their foundations and any extension below ground surface. Surface structures include, but are not limited to, buildings, tanks, walls, bridges, roads, dams, channels, open drainage routes, exposed piping and utilities, poles, exposed wires, posts, signs, markers, curbs, walks, fencing, and other facilities visible at or above ground surface.
2. Existing surface facilities, including but not limited to guard rails, posts, guard cables, signs, poles, markers, curbs, and fencing, that are temporarily removed to facilitate the Work shall be replaced and restored to their pre-construction condition at CONTRACTOR's expense.

C. Protection of Underground Facilities and Surface Structures:
1. CONTRACTOR shall sustain in their places and protect from direct or indirect injury all Underground Facilities and surface structures located within or adjacent to the limits of the Work. Such sustaining and supporting shall be done carefully and as required by the party owning or controlling such structure or facility.
2. Before proceeding with the Work of sustaining and supporting such structure or facility, CONTRACTOR shall satisfy ENGINEER that methods and procedures to be used have been approved by party owning same.
3. CONTRACTOR shall bear all risks attending the presence or proximity of all Underground Facilities and surface structures within or adjacent to limits of the Work, in accordance with the Contract Documents.

4. CONTRACTOR shall be responsible for damage and expense for direct or indirect injury, caused by CONTRACTOR's activities, to structures and facilities. CONTRACTOR shall promptly repair damage caused by CONTRACTOR's activities, to the satisfaction of owner of damaged structure or facility.
5. Protection of Underground Facilities Under Roads and Parking Areas: Provide temporary, heavy-duty steel roadway plates to protect existing manholes, handholes, valve boxes, vaults, and other Underground Facilities near to or visible at the ground surface.

3.4 PROTECTION OF FLOORS AND ROOFS

A. Protection of Floors and Roofs – General:
   1. Use proper protective covering when moving equipment, handling materials or other loads, when painting, handling mortar or grout, and when cleaning walls, ceilings, or structure contents.
   2. Use metal pans to collect oil and cuttings from piping, conduits, and rod threading machines, and under metal cutting machines.
   3. Do not load concrete floors less than 28 days old without written permission of ENGINEER. Do not load floors, roofs, or slabs in excess of design loading.
   4. Do not load roofs without written permission of ENGINEER.
   5. Restrict access to roofs, and keep CONTRACTOR personnel off existing roofs, except as required for the Work.
   6. If access to roofs is required, roofing, parapets, openings, and all other construction on or adjacent to roof shall be protected with suitable plywood or other acceptable means.

3.5 PROTECTION OF INSTALLED MATERIALS, EQUIPMENT, AND LANDSCAPING

A. Protect installed Work to prevent damage from subsequent operations. Remove protective items when no longer needed, prior to Substantial Completion of the Work.

B. Control traffic to prevent damage to equipment, materials, and surfaces.

C. Coverings:
   1. Provide temporary coverings to protect materials and equipment from damage.
   2. Cover projections, wall corners and jambs, sills, and soffits of openings, in areas used for traffic and for passage of materials and equipment in subsequent work.

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SECTION 01 73 19

INSTALLATION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section describes general requirements for installing materials and equipment. Additional installation requirements are included in the various Specifications Sections in Divisions 02 through 49 and elsewhere in the Contract Documents.
   2. CONTRACTOR shall provide all labor, materials, equipment, services, tools, and incidentals required to install materials and equipment.

1.2 QUALITY ASSURANCE

A. General:
   1. Provide appropriate quality assurance for installing materials and equipment, and provide quality control over Suppliers, materials and equipment, services, Site conditions, and workmanship, to provide Work of the required quality.

B. Qualifications:
   1. Installer:
      a. Installers shall be experienced in the types of Work required, including, but not limited to, the requirements of Section 01 42 00, References, and the Division 02 through 49 Specifications where the particular element of the Work is specified.

C. Regulatory Requirements: Comply with the following:
   1. 29 CFR 1910, OSHA.

PART 2 – PRODUCTS

2.1 EQUIPMENT DRIVE GUARDS

A. Equipment Drive Guards – General:
   1. Unless otherwise shown or indicated, provide all-metal guards complying with 29 CFR 1910, Subpart O, with equipment driven by open shafts, belts, chains, pulleys, sheaves, or gears. Guards shall enclose drive and driven mechanism.
   2. If material of guards are not otherwise specified, guards shall be galvanized sheet steel, galvanized woven wire, or expanded metal set in a frame of galvanized steel members, as appropriate.

3. Secure guards in position by steel braces or straps, securely fastened to frame of equipment, floor, or wall as required.
4. Fastenings shall allow removal of guards for servicing equipment.

2.2 MISCELLANEOUS MATERIALS

A. Shims shall be Type 304L stainless steel, clean and free of slag.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General:
1. Installation Instructions and Requirements:
   a. Install materials and equipment in accordance with approved Shop Drawings and CONTRACTOR's other submittals approved by ENGINEER, the Contract Documents, and manufacturer's installation instructions. When manufacturer's installation instructions conflict with the Contract Documents, obtain interpretation or clarification from ENGINEER before proceeding.
   b. Manufacturer's installation instructions include manufacturer's written instructions; drawings; illustrative, wiring and schematic diagrams; diagrams identifying external connections, terminal block numbers and internal wiring; and other such information pertaining to installation of materials and equipment. Included are all of manufacturer's printed installation instructions, including those that may be attached to equipment upon delivery.
2. Prior to installing materials and equipment, complete preparation of surfaces on which materials and equipment are to be installed. Prior to installing materials and equipment on new concrete, concrete shall achieve sufficient compressive strength to support the materials and equipment.
3. Maintain the work area in a broom-clean condition while installing materials and equipment.
4. Use proper tools to assemble materials and equipment. Do not deform or mar surface of shafts, nuts, and other parts.
5. Do not support rigging from building or structure without written permission of ENGINEER. CONTRACTOR is responsible for and shall repair damage to building or structure resulting from CONTRACTOR's operations, in accordance with Section 01 71 33, Protection of the Work and Property.
6. During installation, maintain materials and equipment in neutral position and do not exert undue stress on materials and equipment.
7. Tighten connections requiring gaskets evenly all around to ensure uniform stress over entire gasket.
8. Use only an oil bath heater to expand couplings, gears, and other mechanical components to be expanded for installation. Do not force or drive couplings,

gears, and other mechanical components onto equipment shafts, or subject such items to open flame or torch.

9. Do not alter or repair materials and equipment and do not burn or weld materials and equipment unless required in the Contract Documents or allowed by ENGINEER.
10. Provide plugs in lubrication holes to prevent entry of foreign matter.

B. Setting and Erection:
   1. Install materials and equipment plumb, level, true, and free of rack unless 1otherwise shown or indicated, and demonstrate plumbness and level to ENGINEER. Bring parts to proper bearing after installation and erection.
   2. Anchorages:
      a. Provide anchorage setting drawings in time to coordinate with fabrication of materials and equipment and the Work.
      b. Anchorages shall comply with Section 05 05 33, Anchor Systems. Requests for approval of substitute materials or methods of anchorage shall be in accordance with the General Conditions, Supplementary Conditions, and Section 01 25 00, Substitution Procedures.
   3. Shimming:
      a. Wedging is not allowed.
      b. During installation, use the minimum number of shims required for leveling the equipment.
      c. Provide shims, filling pieces, keys, packing, grouting of the type required by the Contract Documents, and other materials and equipment necessary to properly align, level, and secure apparatus in place.
   4. Installing Equipment onto Foundations:
      a. Using experienced millwrights, carefully set and align equipment on foundations, after equipment soleplates or baseplates (as applicable) have been shimmed to true alignment at anchorages.
      b. Set anchorages in place and tighten nuts against shims.
      c. Check bedplates or wing feet of equipment after securing to foundations and, after confirming alignments, grout soleplates or baseplates (as applicable) in place in accordance with the Contract Documents.
   5. Ream misaligned holes. Do not “force” bolts or keys.
   6. Where applicable, properly align equipment with associated piping and utility connections, without exerting undue stress on connecting piping and utilities.

C. Alignment and Leveling:
   1. Verify that all shafts, couplings, and sheaves are properly aligned and adjust to required tolerances.
   2. Align couplings while equipment is free of external loads.
   3. Check angular and parallel alignment and record actual alignment and submit to ENGINEER. Alignment shall be within tolerances specified in Contract Documents and as recommended by Supplier of the material or equipment item.

4. Use laser indicators or dial indicators for checking angular and parallel alignment. Using dial indicators requires that, during rotation of half-couplings in performing testing, dial indicator shall be maintained in same relative position, and dial indicator readings taken at same place on circumference of coupling.

D. Threaded Connections:
   1. Apply a molybdenum disulfide, anti-seize compound to threads in mechanical connections such as bolts, studs, cap screws, tubing, and other threads, unless otherwise shown or indicated.

3.2 FIELD QUALITY CONTROL

A. Supplier's Services:
   1. When specified, provide competent, qualified representatives of material or equipment Supplier to perform services required, including: supervising installation, checking the completed installation, adjusting, testing of materials and equipment, and where required instructing operations and maintenance personnel in the use and care of materials and equipment.

+ + END OF SECTION + +

SECTION 01 73 24

CONNECTIONS TO EXISTING FACILITIES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes requirements for connections to existing facilities. Requirements for tie-ins and shutdowns necessary to complete the Work are in Section 01 14 16, Coordination with City's Operations.
   2. CONTRACTOR shall provide labor, materials, tools, equipment, and incidentals shown, specified, and required for performing connections to existing facilities.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate Work that will be performed with or before the Work specified in this Section.

C. Related Sections:
   1. Section 01 14 16, Coordination with City's Operations.
   2. Section 01 73 29, Cutting and Patching.

D. General:
   1. Requirements for shutdowns, tie-ins, and other provisions on connections to existing facilities, are indicated in Section 01 14 16, Coordination with City's Operations.
   2. Requirements for cutting and patching are in Section 01 73 29, Cutting and Patching.
   3. To extent possible, materials, equipment, systems, piping, and appurtenances that will be placed into service upon completion of connection to existing facilities shall be checked, successfully tested, and in condition for operation prior to making connections to existing facilities, if valves, gates, or similar watertight and gastight isolation devices are not provided at the connection point.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

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SECTION 01 73 29

CUTTING AND PATCHING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes general requirements for cutting and patching Work.
   2. CONTRACTOR shall perform cutting and coring, and rough and finish patching of holes and openings in existing construction.
   3. Provide cutting, coring, fitting and patching, including attendant excavation and fill, required to complete the Work, and to:
      a. remove and replace defective Work;
      b. remove samples of installed Work as specified or required for testing;
      c. remove construction required to perform required alterations or additions to existing construction;
      d. uncover the Work for ENGINEER's observation of covered Work, testing or inspection by testing entities, or observation by authorities having jurisdiction;
      e. connect to completed Work not performed in proper sequence;
      f. remove or relocate existing utilities and piping that obstruct the Work in locations where connections are to be made;
      g. make connections or alterations to existing or new facilities.

B. Coordination:
   1. Cutting, coring, and rough patching shall be performed by the prime contractor requiring the opening. Finish patching shall be responsibility of general CONTRACTOR and shall be performed by trade associated with application of the particular finish.

1.2 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Cutting and Patching Request:
      a. Submit written request to ENGINEER, well in advance of executing cutting or alteration that affects one or more of the following:
         1) Design function or intent of Project.
         2) Work of CITY or other contractors.
         3) Structural value or integrity of an element of the Project.
         4) Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
         5) Efficiency, operational life, maintenance, or safety of operational elements.

6) Visual qualities of sight-exposed elements.

b. Request shall include:

1) Identification of Project and Contract designation.
2) Description of affected Work of CONTRACTOR and work of others (if any).
3) Necessity for cutting.
4) Effect on work or operations of CITY, other contractors (if any), and on structural or weatherproof integrity of Project.
5) Description of proposed Work, describing: scope of cutting and patching; trades who will be executing the Work; materials and equipment to be used; extent of refinishing; schedule of operations; alternatives to cutting and patching, if any, and net effect on aesthetics following completion of finishing Work.
6) Designation of entity responsible for cost of cutting and patching, when applicable.
7) Written permission of other prime contractors (if any) whose work will or may be affected.

2. Recommendation Regarding Cutting and Patching:

a. Should conditions of work or schedule indicate a change of materials or methods, submit written recommendation to ENGINEER including:

1) Conditions indicating change.
2) Recommendations for alternative materials or methods.
3) Items required with request for approval of substitute, in accordance with the substitution request requirements of the Contract Documents.

3. Product Data:

a. Submit manufacturer's data for the protective compound to be applied to core-drilled surfaces and cut concrete surfaces.

b. When not required under other Sections, submit manufacturer's data on materials to be used for finishing around the cut or patched area.

c. Furnish submittals for patching materials under the associated Specifications Section.

B. Informational Submittals: Submit the following:

1. Written Notification of Cutting and Patching:

a. Submit written indication designating the day and time that the construction associated with cutting and patching will be uncovered to allow for observation. Do not begin cutting or patching operations until submittal is accepted by ENGINEER.

2. X-ray Investigations:

a. Proposed method of investigation. Submit and obtain ENGINEER's acceptance prior to performing X-ray inspections.

b. Report of X-ray evaluation of slabs, floors, and walls to be cut or core-drilled.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Materials - General:
   1. Use materials that comply with the Contract Documents.
   2. If not shown or indicated in the Contract Documents, use materials that are identical to existing materials affected by cutting and patching Work.
   3. For exposed surfaces, use materials that visually match existing adjacent surfaces to fullest extent possible. If identical materials are unavailable or cannot be used, use materials whose installed performance will equal or surpass that of existing materials.
   4. Replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, using materials that do not void required or existing warranties.

B. Compound Applied to Core-Drilled Surfaces and Cut Concrete Surfaces:
   1. After core-drilling and before installing the utility or equipment through the penetration, coat exposed concrete and steel with solvent-free, two-component, protective, epoxy resin coating.
   2. Color shall approximate the finish color of the existing surface to be coated.
   3. Product and Manufacturer: Provide one of the following:
      a. Sikagard 62, by Sika Corporation.
      b. Or equal.

PART 3 – EXECUTION

3.1 GENERAL

A. Perform cutting and coring in such manner that limits extent of patching required.

B. Structural Elements:
   1. Do not cut or patch structural elements in manner that would change the element's structural load-carrying capacity as load deflection ratio.

C. Operating Elements:
   1. Do not cut or patch operating elements in manner that would reduce their capacity to perform as intended.
   2. Do not cut or patch operating elements or related components in manner that would increase maintenance requirements or decrease operational life or safety.

D. Replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, using methods that do not void required or existing warranties.

3.2 INSPECTION

A. Examine surfaces to be cut or patched, and conditions under which cutting or patching will be performed before starting cutting or patching Work.

B. Report unsatisfactory or questionable conditions to ENGINEER in writing. Do not proceed with cutting or patching Work until unsatisfactory conditions are corrected.

C. Non-Destructive Investigation:
   1. In advance of cutting or coring through existing slabs or walls, use X-ray or other non-destructive methods accepted by ENGINEER to determine location of reinforcing steel, electrical conduits, and other items embedded in slabs or walls.
   2. Submit to ENGINEER written report of findings of evaluation.
   3. Perform X-ray investigation and submit results to ENGINEER sufficiently in advance of cutting Work to allow time to identify and implement alternatives, if changes to the Work are necessary because of conduit or other features in floor or wall.

3.3 PREPARATION

A. Provide temporary support required to maintain structural integrity of facilities, to protect adjacent work from damage during cutting, and to support the element(s) to be cut.

B. Protection of Existing Construction during Cutting and Patching:
   1. Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project and facility that will be exposed during cutting and patching operations.
   2. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
   3. Do not cut existing pipe, conduit, ductwork, or other utilities serving facilities scheduled to be removed or relocated until provisions have been made to bypass them.

3.4 CORING

A. Use core-drilling to make penetrations through concrete and masonry walls, slabs, or arches, unless otherwise accepted by ENGINEER in writing.

B. Coring:
   1. Perform coring with non-impact rotary tool using diamond core-drills. Size holes for pipe, conduit, sleeves, equipment or mechanical seals, as required, to be installed through the penetration.

2. Do not core-drill through electrical conduit or other utilities embedded in walls or slabs without approval of ENGINEER. To extent possible, avoid cutting reinforcing steel in slabs and walls.

C. Protection:
1. Protect existing equipment, utilities, and adjacent areas from water and other damage caused by or resulting from core-drilling operations.
2. After core-drilling and before installing the utility or equipment through the penetration, coat exposed concrete and steel with protective coating material indicated in Paragraph 2.1.B of this Section. Apply protective coating in accordance with manufacturer's instructions.

D. Cleaning:
1. After core-drilling, vacuum or otherwise remove slurry and tailings from the work area.

3.5 CUTTING

A. Cutting – General:
1. Cut existing construction using methods least-likely to damage elements retained and adjoining construction and that provide proper surfaces to receive subsequent installation or repair.
2. In general, use hand tools or small power tools suitable for sawing or grinding. When possible, avoid using hammering and avoid chopping.
3. Cut holes and slots as small as possible, neatly to the size required, and with minimum disturbance of adjacent surfaces.
4. Prior to starting cutting, provide adequate bracing of area to be cut.
5. To avoid marring existing finished surfaces, cut or drill from exposed or finished side into concealed side.
6. Provide equipment of adequate size to remove the cut panel or "coupon".
7. Provide temporary covering over cut openings where not in use.

B. Cutting – Concrete and Masonry:
1. Cut through concrete and masonry using concrete wall saw with diamond saw blades.
2. On both of the element being cut, provide for control of slurry generated during sawing.
3. After cutting concrete and before installing subsequent construction on or through the opening, coat exposed concrete and steel with protective coating material indicated in Paragraph 2.1.B of this Section. Apply protective coating in accordance with manufacturer's instructions.

3.6 PATCHING

A. Patching – General:

1. Patch construction by filling, repairing, refinishing, closing-up, and similar operations following performance of other Work.
2. Patch with durable seams that are as inconspicuous as possible. Provide materials and comply with installation requirements indicated in the Contract Documents.
3. Patch to provide airtight and watertight connections to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
4. Where feasible, test patched areas to demonstrate integrity of installation.

B. Restoration:
1. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in manner that eliminates evidence of patching and refinishing.
2. For continuous surfaces, refinish to nearest intersection.
3. For an assembly, refinish the entire unit that was patched.
4. Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.7 CLEANING

A. Cleaning and Restoration:
1. Clean areas and spaces where cutting, coring, or patching were performed.
2. Clean piping, conduit, and similar constructions before applying paint or other finishing materials.
3. Restore damaged coverings of pipe and other utilities to original condition.

+ + END OF SECTION + +

SECTION 01 74 05

CLEANING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes requirements for keeping the Site free of accumulations of waste materials during construction ("progress cleaning") and cleaning for Substantial Completion and prior to final inspection (collectively, "closeout cleaning").
   2. Each prime CONTRACTOR shall perform cleaning during the Project, including progress cleaning, and as required by the General Conditions, as may be modified by the Supplementary Conditions, and this Section.
   3. Each prime CONTRACTOR shall maintain in a clean manner the Site, the Work, and areas adjacent to or affected by the Work and required to dispose of wastes as a result of their Work.
   4. General CONTRACTOR shall perform closeout cleaning at the end of the Project and upon completion of the Work, and as required by the General Conditions, as may be modified by the Supplementary Conditions, and this Section.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. NFPA 241, Safeguarding Construction, Alteration, and Demolition Operations.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 PROGRESS CLEANING

A. General:
   1. Clean the Site, work areas, and other areas occupied by CONTRACTOR not less than weekly. Dispose of materials in accordance with the General Conditions, as may be modified by the Supplementary Conditions, and the following:
      a. Comply with NFPA 241 for removing combustible waste materials and debris.

b. Do not hold non-combustible materials at the Site more than three days if the temperature is expected to rise above 80 degrees F. When temperature is less than 80 degrees F, dispose of non-combustible materials within seven days of their generation.
c. Provide suitable containers for storage of waste materials and debris.
d. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately.

B. Site:
1. Keep outdoor, dust-generating areas wetted down or otherwise control dust emissions.
2. Not less than weekly, brush-sweep roadways and paved areas at the Site that are used by construction vehicles or otherwise affected by construction activities.

C. Work Areas:
1. Clean areas where the Work is in progress to maintain the extent of cleanliness necessary for proper execution of the Work.
2. Remove liquid spills promptly. Immediately report spills to DEPARTMENT, ENGINEER, and authorities having jurisdiction, in accordance with the Contract Documents and Laws and Regulations.
3. Where dust would impair proper execution of the Work, broom-clean or vacuum entire work area, as appropriate.
4. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

D. Installed Work:
1. Keep installed Work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of material or equipment installed, using only cleaning agents and methods specifically recommended by material or equipment manufacturer. If manufacturer does not recommend specific cleaning agents or methods, use cleaning agents and methods that are not hazardous to health and property and that will not damage exposed surfaces.

E. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration until Substantial Completion.

F. Cutting and Patching:
1. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, trailings and cuttings, and similar materials.
2. Thoroughly clean piping, conduits, and similar features before applying patching material, paint, or other finishing materials. Restore damaged coverings on piping, ducting, and similar items to its pre-construction condition.

G. Cleaning of Hydraulic Structures: Clean hydraulic structures that will contain fluid, such as tanks and channels, in accordance with this Section and Section 01 45 53, Cleaning, Testing, and Disinfecting Hydraulic Structures.

H. Waste Disposal:
   1. Properly dispose of waste materials, surplus materials, debris, and rubbish off the Site.
   2. Do not burn or bury rubbish and waste materials at the Site.
   3. Do not discharge volatile or hazardous substances, such as mineral spirits, oil, or paint thinner, into storm sewers or sanitary sewers.
   4. Do not discharge wastes into surface waters or drainage routes.
   5. CONTRACTOR is solely responsible for complying with Laws and Regulations regarding storing, transporting, and disposing of waste generated by CONTRACTOR's operations or brought to the Site by CONTRACTOR.

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

J. Clean completed construction as frequently as necessary throughout the construction period.

3.2 CLOSEOUT CLEANING

A. Complete the following prior to requesting inspection for Substantial Completion:
   1. Clean and remove from the Site rubbish, waste material, debris, and other foreign substances.
   2. Sweep paved areas broom-clean. Remove petrochemical spills, stains, and other foreign deposits.
   3. Hose-clean sidewalks and loading areas.
   4. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
   5. Leave surface waterways, drainage routes, storm sewers, and gutters open and clean.
   6. Repair pavement, roads, sod, and other areas affected by construction operations and restore to specified condition; if condition is not specified, restore to pre-construction condition.
   7. Clean exposed exterior and interior hard-surfaced finishes to dirt-free condition, free of spatter, grease, stains, fingerprints, films, and similar foreign substances.
   8. Clean, wax, and polish wood, vinyl, and painted floors.
   9. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, and similar spaces.
   10. In unoccupied spaces, sweep concrete floors broom-clean.

11. Clean transparent materials, including mirrors and glazing in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
12. Remove non-permanent tags and labels.
13. Surface Finishes:
    a. Touch-up and otherwise repair and restore chipped, scratched, dented or otherwise marred surfaces to specified finish and match adjacent surfaces.
    b. Do not paint over "UL" or similar labels, including mechanical and electrical nameplates.
14. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint, and mortar droppings, and other foreign substances.
15. Clean plumbing fixtures to sanitary condition, free of stains, including stains resulting from water exposure.
16. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
17. Clean lighting fixtures, lamps, globes, and reflectors to function with full efficiency. Replace temporary lamps provided in permanent fixtures. Replace existing lighting fixture components that are burned out or noticeably dimmed from use during construction. Replace defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
18. Leave the Site clean, and in neat, orderly condition, satisfactory to CITY, DEPARTMENT and ENGINEER.

B. Complete the following prior to requesting final inspection:
    1. Following completion of the Work on the "punch list" of Work uncompleted at Substantial Completion, clean in accordance with Paragraph 3.2.A of this Section.

+ + END OF SECTION + +

SECTION 01 75 11

CHECKOUT AND STARTUP PROCEDURES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall initially start up and place equipment and systems installed under the Contract into successful operation, in accordance with the equipment manufacturer's written instructions and as instructed by Supplier at the Site.
   2. Provide all material, labor, tools, and equipment required to complete equipment checkout and start-up.
   3. Provide chemicals, lubricants, and other required operating fluids.
   4. Provide fuel, electricity, water, filters, and other expendables required for start-up of equipment, unless otherwise specified.
   5. General activities by CONTRACTOR include the following:
      a. Cleaning, as required under other provisions of the Contract Documents.
      b. Removing temporary protective coatings.
      c. Flushing and replacing lubricants, where required by manufacturer.
      d. Lubrication.
      e. Checking shaft and coupling alignments and resetting where required.
      f. Checking and setting motor, pump, and other equipment rotation, safety interlocks, and belt tensions.
      g. Checking and correcting (as necessary) leveling plates, grout, bearing plates, anchorage devices, fasteners, and alignment of piping, conduits, and ducts that may place stress on the connected equipment.
      h. Performing all adjustments required.

B. Coordination:
   1. Coordinate checkout and start-up with other contractors, as necessary.
   2. Do not start up system or subsystem for continuous operation until all components of that system or subsystem, including instrumentation and controls, have been tested to the extent practicable and proven to be operable as intended by the Contract Documents.
   3. OWNER will furnish sufficient personnel to assist CONTRACTOR in starting up equipment, but responsibility for proper operation is CONTRACTOR's.
   4. Supplier shall be present during checkout, startup, and initial operation, unless otherwise acceptable to ENGINEER.
   5. Startup of heating equipment, air conditioning equipment, and other equipment that provides cooling or other temperature control, and systems is dependent upon the time of year. Return to the Site at beginning of next heating or cooling season (as applicable) to recheck and start the appropriate systems.

6. Do not start up system, unit process, or equipment without submitting acceptable preliminary operations and maintenance manuals by CONTRACTOR in accordance with Section 01 78 23, Operations and Maintenance Data.

C. DEPARTMENT's Assumption of Responsibility for Equipment and Systems:
   1. CITY will assume responsibility for the equipment upon Substantial Completion, unless otherwise mutually agreed upon by DEPARTMENT and CONTRACTOR or as documented in the certificate of Substantial Completion.
   2. Before turning over to CITY responsibility for operating and maintaining system or equipment CONTRACTOR shall:
      a. Provide training of operations and maintenance personnel in accordance with Section 01 79 23, Instruction of Operations and Maintenance Personnel.
      b. Complete performance of equipment and system field quality control testing in accordance with the Contract Documents, to the extent possible.
      c. Submit acceptable final operations and maintenance manuals in accordance with Section 01 78 23, Operations and Maintenance Data.
      d. Obtain from ENGINEER final certificate of Substantial Completion for either entire Work or the portion being turned over to CITY.

1.2 SUBMITTALS

A. Closeout Submittals: Submit the following:
   1. Certifications:
      a. Supplier's certification of installation in accordance with Paragraph 3.1.B of this Section.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 SERVICES OF SUPPLIER

A. When specified, furnish services of competent, qualified representatives of material and equipment manufacturers, including supervising installation, adjusting, checkout, startup, and testing of materials and equipment.

B. Certification:
   1. When services by Supplier are required at the Site, within 14 days after first test operation of equipment, submit to ENGINEER a letter from Supplier, on Supplier's letterhead, stating that materials and equipment are installed in

accordance with Supplier's requirements and installation instructions, and in accordance with the Contract Documents.

2. In lieu of Supplier letter, submit completed form attached to this Section.
3. Include in the final operations and maintenance manual for the associated equipment a copy of the letter or completed form, as applicable.

3.2 MINIMUM STARTUP REQUIREMENTS

A. Bearings and Shafting:
   1. Inspect for cleanliness, and clean and remove foreign matter.
   2. Verify alignment.
   3. Replace defective bearings and those that operate in a rough or noisy manner.
   4. Grease as necessary, in accordance with manufacturer's recommendations.

B. Drives:
   1. Adjust tension in V-belt drives and adjust vari-pitch sheaves and drives for proper equipment speed.
   2. Adjust drives for alignment of sheaves and V-belts.
   3. Clean and remove foreign matter before starting operation.

C. Motors:
   1. Check each motor for comparison to amperage nameplate value.
   2. Correct conditions that produce excessive current flow and conditions that exist due to equipment malfunction.

D. Pumps:
   1. Check glands and seals for cleanliness and adjustment before running pump.
   2. Inspect shaft sleeves for scoring.
   3. Inspect mechanical faces, chambers, and seal rings, and replace if defective.
   4. Verify that piping system is free of dirt and scale before circulating liquid through pump.

E. Valves:
   1. Inspect manual and automatic control valves, and clean bonnets and stems.
   2. Tighten packing glands to ensure no leakage, but allow valve stems to operate without galling.
   3. Replace packing in valves to retain maximum adjustment after system is determined to be complete.
   4. Replace packing on valves that continue to leak.
   5. Remove, correct, and replace bonnets that leak.
   6. After cleaning, coat packing gland threads and valve stems with surface preparation of "Molycote" or "Fel-Pro".

F. Verify that control valve seats are free of foreign matter and are properly positioned for intended service.

G. Pipe Joints and Other Connections:
   1. Tighten flanges and other pipe joints after system has been placed in operation.
   2. Replace gaskets that show signs of leakage after tightening.
   3. Inspect all joints for leakage.
   4. Promptly remake each joint that appears to be faulty; do not wait for rust other corrosion to form.
   5. Clean threads on both parts, and apply compound and remake joints.

H. After system has been placed in operation, clean strainers, drives, pockets, orifices, valve seats, and headers in fluid system to ensure freedom from foreign matter.

I. Open steam traps and air vents, where used, and remove operating elements. Clean thoroughly, replace internal parts, and place back into operation.

J. Remove rust, scale, and foreign matter from equipment and renew defaced surfaces.

K. Set and calibrate draft gauges of air filters and other equipment.

L. Inspect fan wheels for clearance and balance. Provide factory-authorized personnel for adjustment where needed.

M. Check each electrical control circuit to verify that operation complies with the Contract Documents.

N. Inspect each pressure gauge, thermometer, and other instruments for calibration. Replace items that are defaced, broken, or that read incorrectly.

O. Repair damaged insulation.

P. Excess Gasses and Fluids:
   1. Vent gasses trapped in systems.
   2. Verify that liquids are drained from all parts of gas or air systems.

3.3 ATTACHMENTS

A. The attachment listed below, following this Section's "End of Section" designation, is a part of this Specification Section.
   1. Supplier's Installation Certification Form (one page).

+ + END OF SECTION + +

SUPPLIER'S INSTALLATION CERTIFICATION

Contract No. and Name: _____

Equipment Specification Section: _____

Equipment Name: _____

Contractor: _____

Manufacturer of Equipment: _____

The undersigned Supplier of the equipment or system described above hereby certifies that Supplier has checked the installation of the equipment or system and that the equipment or system, as specified in the Contract Documents, has been provided in accordance with the manufacturer's recommendations and the Contract Documents, and that the trial operation of the equipment or system has been satisfactory.

Comments: _____

_____	_____
Date	Supplier Name (print)
	_____
	Signature of Supplier
_____	_____
Date	Contractor Name (print)
	_____
	Signature of Contractor

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SECTION 01 77 19

CLOSEOUT REQUIREMENTS

PART 1 – GENERAL

1.1 GENERAL

A. Scope:
   1. Section Includes.
      a. Substantial Completion.
      b. Final inspection.
      c. Request for final payment and acceptance of the Work.

1.2 SUBSTANTIAL COMPLETION

A. Substantial Completion – General:
   1. Prior to requesting Substantial Completion, perform the following for the substantially completed Work:
      a. Materials and equipment for which Substantial Completion is requested shall be fully ready for their intended use, including full operating and monitoring capability in automatic and manual modes.
      b. Complete field quality control Work, including testing at the Site, indicated in Specifications Sections for individual materials and equipment items. Submit results of, and obtain ENGINEER's acceptance of, field quality control tests required by the Contract Documents.
      c. Startup and checkout shall be completed in accordance with Section 01 75 11, Startup and Checkout Procedures, and requirements of the Specifications for the various materials and equipment in the substantially completed Work.
      d. Cleaning for Substantial Completion shall be completed in accordance with Section 01 74 05, Cleaning.
      e. Spare parts, extra stock materials, and tools shall be delivered and accepted in accordance with Section 01 78 43, Spare Parts and Extra Materials, and the Specifications for the various materials and equipment.
      f. Training shall be completed in accordance with Section 01 79 23, Instruction of Operations and Maintenance Personnel.
      g. Submit and obtain ENGINEER's acceptance of final operations and maintenance manuals.
      h. Obtain and submit to ENGINEER all required permits, inspections, and approvals of authorities having jurisdiction for the substantially completed Work to be occupied and used by CITY.
      i. Complete other tasks that the Contract require be completed prior to Substantial Completion.

2. Procedures for requesting and documenting Substantial Completion are in the General Conditions, as may be modified by the Supplementary Conditions.
3. Sample letter for CONTRACTOR to request inspection for Substantial Completion is attached to this Specifications Section. Use the model language of the sample letter, modified to suit the Project.
4. Unless decided otherwise by DEPARTMENT and ENGINEER, form of certificate of Substantial Completion will be EJCDC® C-625, "Certificate of Substantial Completion" (2013 edition), prepared by ENGINEER.

1.3 FINAL INSPECTION

A. Final Inspection – General:
1. Prior to requesting final inspection, verify that all of the Work is fully complete and ready for final payment. Partial checklist for this purpose is attached to this Specifications Section.
2. Sample letter for CONTRACTOR to request final inspection is attached to this Specifications Section. Use the model language of the sample letter, modified to suit the Project.
3. Procedures for requesting and documenting the final inspection are in the General Conditions, as may be modified by the Supplementary Conditions, and as augmented in this Section.

1.4 REQUEST FOR FINAL PAYMENT AND ACCEPTANCE OF THE WORK

A. Procedure:
1. Submit request for final payment in accordance with the General Conditions, as may be modified by the Supplementary Conditions.
2. Acceptance of the Work:
   a. Upon ENGINEER's receipt of the final Application for Payment, accompanied by other required Contract closeout documentation in accordance with the Contract Documents, ENGINEER will issue to DEPARTMENT and CONTRACTOR a notice of acceptability of the Work, in accordance with the General Conditions, as may be modified by the Supplementary Conditions.
   b. Nothing other than receipt of such notice of acceptability from ENGINEER constitutes acceptance of the Work.
   c. Unless decided otherwise by DEPARTMENT and ENGINEER, form of acceptance will be EJCDC® C-626, "Notice of Acceptability of Work", (2014 edition).

B. Request for final payment shall include:
   1. Documents required for progress payments as required by the General Conditions.
   2. Documents required in the Agreement.
   3. List of all disputes that Contractor believes are unsettled.
   4. Consent of Surety to Final Payment:
      a. Acceptable form includes AIA® G707™, "Consent of Surety to Final Payment" (1994 or later edition), or other form acceptable to DEPARTMENT.
   5. Releases or Waivers of Lien Rights:
      a. When submitting releases or waivers of Lien rights, furnish release or waiver by CONTRACTOR and each Subcontractor and Supplier that provided CONTRACTOR, Subcontractor, or Supplier with labor, material, or equipment totaling $1,000 or more for the Contract.
      b. Furnish final list of Subcontractors and Suppliers, using the form included in Section 01 29 76, Progress Payment Procedures, indicating final amount of the associated subcontract or purchase order for each. Include on the list all lower-tier Subcontractors and Suppliers retained by Subcontractors and Suppliers with direct subcontract or purchase order with CONTRACTOR.
      c. Each release or waiver of Lien shall be signed by an authorized representative of the entity submitting release or waiver of Lien, and shall include CONTRACTOR's, Subcontractor's, or Supplier's (as applicable) corporate seal, when applicable.
      d. Release or waiver of Lien may be conditional upon receipt of final payment.
   6. Affidavits:
      a. In lieu of the release or waiver of Liens, CONTRACTOR may submit the following, for CONTRACTOR and each Subcontractor and Supplier that provided CONTRACTOR, Subcontractor, or Supplier with labor, material, or equipment totaling $1,000 or more, to DEPARTMENT's satisfaction:
         1) Affidavit of payment of debts and claims. Acceptable form includes AIA® G706™, "Contractor's Affidavit of Payment of Debts and Claims" (1994 or later edition), or other form acceptable to DEPARTMENT, and;
         2) Affidavit of release of Liens. Acceptable form includes AIA® G706A™, "Affidavit of Release of Liens" (1994 or later edition), or other form acceptable to DEPARTMENT.
      b. Affidavits and supporting documents furnished under this Paragraph 1.4.B.6 shall comply with the requirements of the General Conditions, as may be modified by the Supplementary Conditions.
      c. Each affidavit furnished shall be signed by an authorized representative of the entity furnishing the affidavit, and shall include CONTRACTOR's, Subcontractor's, or Supplier's (as applicable) corporate seal, when applicable.

7. Evidence satisfactory to DEPARTMENT that all title issues have been resolved such that title to all Work, materials, and equipment has passed to DEPARTMENT free and clear of Liens or other title defects, or will so pass upon final payment.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 ATTACHMENTS

A. The documents listed below, following this Section's "End of Section" designation, are part of this Specifications Section:
   1. Sample letter for Contractor's use in requesting inspection for Substantial Completion (two pages).
   2. Sample partial checklist to identify readiness for final inspection (four pages).
   3. Sample letter for Contractor's use in requesting final inspection (one page).

B. In the model language of the attached sample letters for the CONTRACTOR to request inspection for Substantial Completion and the final inspection, italicized language in brackets, e.g., "[*insert date*]" indicates instructions to the drafter of the letter and often indicates specific information to be inserted by CONTRACTOR; do not include bracketed, italicized text in the final version of the letter(s) prepared for the Project. Non-italicized language in brackets is optional language; use the appropriate language to complete the actual letter for the Project and edit where required to suit the specific circumstances.

+ + END OF SECTION + +

SAMPLE LETTER FOR CONTRACTOR'S USE IN REQUESTING INSPECTION FOR SUBSTANTIAL COMPLETION

SENT VIA E-MAIL AND U.S. CERTIFIED MAIL/RETURN RECEIPT REQUESTED

[*Date*]

[*Name of Engineer's contact person*]
ARCADIS CE, Inc.
[*Street address*]
[*City, state, postal code*]

Subject:
[*Project name, Contract designation*]
Request for Inspection for Substantial Completion

Dear [*addressee*]:

In our opinion, [all of] [*or*] [a portion of] the Work under the above-referenced Contract is substantially complete as of [*insert month, day, year on which Substantial Completion was achieved*]. [The specific portion of the Work that we believe is substantially complete is [*insert identification of that portion of the Work that is substantially complete*].]

Enclosed is our listing of uncompleted Work items ("punch list"). In accordance with Paragraph 13.6 of the General Conditions, we hereby request: 1) That the Engineer schedule and perform the inspection for Substantial Completion as soon as possible, and 2) Issuance of the certificate of Substantial Completion.

In accordance with Paragraph 13.6 of the General Conditions, upon Substantial Completion, we propose the following relative to apportionment of responsibilities between the DEPARTMENT and the Contractor:

1. Security, Protection, Insurance:
    a. Site Security: [*insert proposal; address whether DEPARTMENT or Contractor will be responsible for security of the Site*].
    b. Protection of the Substantially Completed Work: [*insert proposal; address whether DEPARTMENT or Contractor will be responsible for protection*].
    c. Property Insurance: [*insert proposal; typically DEPARTMENT assumes responsibility for property insurance upon Substantial Completion*]
2. Operation and Maintenance:

a. Operation: [*insert proposal; address whether DEPARTMENT or Contractor will be responsible for operating the substantially completed Work*].

b. Maintenance: [*insert proposal; address whether DEPARTMENT or Contractor will be responsible for maintaining the substantially completed Work*].

3. Utilities: [*for each of the following, indicate whether DEPARTMENT or Contractor will be responsible for utilities and services, or whether responsibility will be shared; if shared, indicate proposed cost-sharing*]

   a. Electricity: [*insert proposal*].

   b. Natural Gas/Fuel/Heating: [*insert proposal*].

   c. Water Supply: [*insert proposal*].

   d. Wastewater: [*insert proposal*].

   e. Communications (Telephone, Internet, Video): [*insert proposal*].

In accordance with Paragraph 13.6 of the General Conditions, we understand that the Contract's correction period for the Work covered by the certificate of Substantial Completion commences on the Substantial Completion date documented in said certificate. [*Drafter: Also see Paragraph 13.6 of the General Conditions and, where necessary, edit this paragraph of the letter accordingly.*]

Should you have questions or comments regarding this notice, please contact [the undersigned] [*or*] [*insert other contact person's name*], at [*insert telephone number and e-mail address*].

Sincerely,

[*Contractor's company name*]

[*Signatory name*]
[*Signatory's title*]

Attachments:
Preliminary list of uncompleted Work items ("punch list"; [*##*] pages)

Copies:
[*DEPARTMENT's project manager*]

SAMPLE PARTIAL CHECKLIST TO IDENTIFY READINESS FOR FINAL INSPECTION

Project: _____
Contract: _____
Contractor: _____

Item No./Description	Completed/Date		In Progress	Not Started	Not Applicable	Target Date	Responsible Entity/Person
1. All Shop Drawings, Samples, and Submittals approved by Engineer	☐		☐	☐	☐		
Remarks:							
2. Final services completed by Suppliers, including submittal of "Supplier Installation Certification" in Section 01 75 11, Checkout and Startup Procedures	☐		☐	☐	☐		
Remarks:							
3. Final Work completed by Subcontractors	☐		☐	☐	☐		
Remarks:							
4. Permits closed out and regulatory compliance transitioned from construction to operations	☐		☐	☐	☐		
Remarks:							
5. All outstanding change issues	☐		☐	☐	☐		

Item No./Description	Completed/Date		In Progress	Not Started	Not Applicable	Target Date	Responsible Entity/Person
are addressed and all Change Proposals submitted							
Remarks:							
6. All Claims are resolved	☐		☐	☐	☐		
Remarks:							
7. All defective Work of which Contractor is aware has been corrected in accordance with the Contract Documents	☐		☐	☐	☐		
Remarks:							
8. Issues related to Constituents of Concern and potential Hazardous Environmental Condition have been fully addressed	☐		☐	☐	☐		
Remarks:							
9. All spare parts, tools, and extra stock materials have been furnished in accordance with the Contract Documents, and documentation thereof submitted to Engineer	☐		☐	☐	☐		
Remarks:							
10. All final Operations & Maintenance manuals have been	☐		☐	☐	☐		

Item No./Description	Completed/Date		In Progress	Not Started	Not Applicable	Target Date	Responsible Entity/Person
submitted and accepted by Engineer							
Remarks:							
11. Manufacturer warranties and software license(s) furnished	☐		☐	☐	☐		
Remarks:							
12. Instruction and training of operations and maintenance personnel is complete and records of training submitted	☐		☐	☐	☐		
Remarks:							
13. MBE/WBE/DBE compliance report(s) submitted (when applicable)	☐		☐	☐	☐		
Remarks:							
14. All field engineering submittals, including survey data, furnished	☐		☐	☐	☐		
Remarks:							
15. All Work on “punch list” is complete in accordance with the Contract Documents	☐		☐	☐	☐		
Remarks:							
16. All record documents submitted to and accepted by Engineer	☐		☐	☐	☐		

Item No./Description	Completed/Date		In Progress	Not Started	Not Applicable	Target Date	Responsible Entity/Person
Remarks:							
17. Contractor is fully demobilized from Site	☐		☐	☐	☐		
Remarks:							
18. All Site restoration is complete	☐		☐	☐	☐		
Remarks:							
19. Final cleaning of all work areas is complete	☐		☐	☐	☐		
Remarks:							
20. Lien waivers or affidavits of payment obtained from Subcontractors and Suppliers	☐		☐	☐	☐		
Remarks:							
21. Evidence of Contractor liability insurance furnished for correction period	☐		☐	☐	☐		
Remarks:							
22. All other required Contract closeout documents obtained	☐		☐	☐	☐		
Remarks:							

SAMPLE LETTER FOR CONTRACTOR'S USE IN REQUESTING FINAL INSPECTION

SENT VIA E-MAIL AND U.S. CERTIFIED MAIL/RETURN RECEIPT REQUESTED

[*Date*]

[*Name of Engineer's contact person*]
ARCADIS CE, Inc.
[*Street address*]
[*City, state, postal code*]

Subject:
[*Project name, Contract designation*]
Request for Final Inspection

Dear [*addressee*]:

In our opinion, all of the Work under the above-referenced Contract is complete and ready for final payment as of [*insert month, day, year on which final completion was achieved*]. In accordance with Paragraph 13.9 of the General Conditions, we hereby request that the Engineer schedule and perform the final inspection as soon as possible. Upon successful completion of the final inspection, we will submit our final Application for Payment accompanied by the required Contract closeout documentation in accordance with the Contract Documents.

Should you have questions or comments regarding this notice, please contact [the undersigned] [*or*] [*insert other contact person's name*], at [*insert telephone number and e-mail address*].

Sincerely,

[*Contractor's company name*]

[*Signatory name*]
[*Signatory's title*]

Attachments:
None

Copies:
[*DEPARTMENT's project manager*]

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SECTION 01 78 23

OPERATIONS AND MAINTENANCE DATA

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes requirements for manufacturers' operations and maintenance manuals and related data to be furnished by CONTRACTOR.
   2. CONTRACTOR shall submit operation and maintenance data, in accordance with this Section and in accordance with requirements elsewhere in the Contract Documents, as instructional and reference manuals by operations and maintenance personnel at the Site.
   3. Required operation and maintenance data groupings are listed in table(s) in Article 1.2 of this Section. At minimum, submit operation and maintenance data for:
      a. All equipment and systems.
      b. Valves, gates, actuators, and related accessories.
      c. Instrumentation and control devices.
      d. Electrical equipment.
   4. For each operation and maintenance manual, submit the following:
      a. Preliminary Submittal: Printed and bound copy of entire operation and maintenance manual, except for test data, service reports by Supplier, and submit electronic copies.
      b. Final Submittal: Printed and bound copy of complete operations and maintenance manual, including test data and service reports by Supplier, and submit electronic copies.

1.2 SUBMITTALS

A. Closeout Submittals: Submit the following:
   1. Operation and Maintenance Data:
      a. Submit the operations and maintenance data indicated in the Contract Documents, grouped into submittals as indicated in Table 01 78 23-A:

TABLE 01 78 23-A, REQUIRED OPERATIONS AND MAINTENANCE DATA

Name of O&M Manual/Data	For Materials or Equipment Specified in Section(s)
Instrumentation and Control System	40 60 05
Ductless Split-System Air-Conditioners	23 81 26
Electric Unit Heaters	23 82 39.43
Vacuum Vented Gas Radiant Heaters	23 83 26.1
Desiccant Dehumidification Units	23 84 19
Domestic Water Heaters	22 33 00
Hoists	41 22 23

Name of O&M Manual/Data	For Materials or Equipment Specified in Section(s)
Fire Detection and Alarm Systems	28 31 00
Centrifugal End Suction Pumps Dry Pit	43 21 13.12
Centrifugal Axial Split Case Pumps	43 21 13.23
Process Valves	40 05 53
Access Hatches	05 50 13
Low-Voltage Manual Motor Starters	26 29 36
Low-Voltage Combination Magnetic Motor Starters	26 29 37
Engine Generators	26 32 13
Automatic Transfer Switches	26 36 23

B. Quantity Required and Timing of Submittals:
   1. Preliminary Submittal:
      a. Printed Copies: two copies, exclusive of copies required by CONTRACTOR.
      b. Electronic Copies: In accordance with Section 01 31 26, Electronic Communication Protocols.
      c. Submit to ENGINEER by the earlier of: 90 days following approval of Shop Drawings and product data submittals, or 10 days prior to starting training of operations and maintenance personnel, or 10 days prior to field quality control testing at the Site.
      d. Furnish preliminary operation and maintenance data submittal in acceptable form and content, as determined by ENGINEER, before associated materials and equipment will be eligible for payment.
   2. Final Submittal: Furnish final submittal prior to Substantial Completion, unless submittal is specified as required prior to an interim Milestone.
      a. Printed Copies: two copies.
      b. Electronic Copies: In accordance with Section 01 31 26, Electronic Communication Protocols.

1.3 FORMAT OF PRINTED COPIES

A. Binding and Cover:
   1. Bind each operation and maintenance manual in durable, permanent, stiff-cover binder(s), comprising one or more volumes per copy as required. Binders shall be not less than one inch wide and maximum of three inches wide. Binders for each copy of each volume shall be identical.
   2. Binders shall be locking three-ring/"D"-ring type, or three-post type. Three-ring binders shall be riveted to back cover and include plastic sheet lifter (page guard) at front of each volume.
   3. Do not overfill binders.
   4. Covers shall be oil-, moisture-, and wear-resistant, including identifying information on cover and spine of each volume.
   5 Provide the following information on cover of each volume:
      a. Title: "OPERATING AND MAINTENANCE INSTRUCTIONS".
      b. Name or type of material or equipment covered in the manual.
      c. Volume number, if more than one volume is required, listed as "Volume

__ of __", with appropriate volume-designating numbers filled in.

d. Name of Project and, if applicable, Contract name and number.

e. Name of building or structure, as applicable.

6 Provide the following information on spine of each volume:

a. Title: "OPERATING AND MAINTENANCE INSTRUCTIONS".

b. Name or type of material or equipment covered in the manual.

c. Volume number, if more than one volume is required, listed as "Volume __ of __", with appropriate volume-designating numbers filled in.

d. Project name and building or structure name.

B. Pages:

1. Print pages in operations and maintenance manual on 30-pound (minimum) paper, 8.5 inches by 11 inches in size.
2. Reinforce binding holes in each individual sheet with plastic, cloth, or metal. When published, separately-bound booklets or pamphlets are part of the manual, reinforcing of pages within booklet or pamphlet is not required.
3. Furnish each page with binding margin not less than one inch wide. Punch each page with holes suitable for the associated binding.

C. Drawings:

1. Bind into the operation and maintenance manual drawings, diagrams, and illustrations up to and including 11 inches by 17 inches in size, with reinforcing specified for pages.
2. Documents larger than 11 inches by 17 inches shall be folded and inserted into clear plastic pockets bound into the manual. Mark pockets with printed text indicating content and drawing numbers. Include not more than three drawing sheets per pocket.

D. Copy Quality and Document Clarity:

1. Contents shall be original-quality copies. Documents in the operations and maintenance manual shall be either original manufacturer-printed documents or first-generation photocopies indistinguishable from originals. If original is in color, copies shall be in color. Manuals that contain copies that are unclear, not completely legible, off-center, skewed, or where text or drawings are cut by binding holes, are unacceptable. Pages that contain approval or date stamps, comments, or other markings that cover text or drawing are unacceptable. Faxed copies are unacceptable.
2. Clearly mark in ink to indicate all components of materials and equipment on catalog pages for ease of identification. In standard or pre-printed documents, indicate options furnished or cross out inapplicable content. Using highlighters to so indicate options furnished is unacceptable.

E. Organization:

1. Table of Contents:

a. Provide table of contents in each volume of each operations and maintenance manual.

b. In table of contents and not less than once in each chapter or section,

identify materials and equipment by their functional names. Thereafter, abbreviations and acronyms may be used if their meaning is clearly indicated in a table bound at or near beginning of each volume. Using material or equipment model or catalog designations for identification is unacceptable.

2. Use dividers and indexed tabs between major categories of information, such as operating instructions, preventive maintenance instructions, and other major subdivisions of data in each manual.

1.4 FORMAT OF ELECTRONIC COPIES

A. Electronic Copies of Operation and Maintenance Manuals:
   1. Each electronic copy shall include all information included in the corresponding printed copy.
   2. Submit electronic copies in accordance with Section 01 31 26, Electronic Communications Protocols.
   3. File Format:
      a. Files shall be in "portable document format" (PDF). Files shall be electronically searchable.
      b. Submit separate file for each separate document in the printed copy.
      c. Within each file, provide bookmarks for the following:
         1) Each chapter and subsection listed in the corresponding printed copy document's table of contents.
         2) Each figure.
         3) Each table.
         4) Each appendix.
   4. Also submit drawings and figures in one of the following formats: ".bmp", ".tif", ".jpg", or ".gif". When files are submitted on CD, submit such files in a separate directory on the CD. When such files are submitted via other means, appropriately transmit them to avoid confusion with other files transmitted.

B. Copies of Programming and Configuration Files:
   1. Furnish on CD or portable USB "thumb drive" copy of all software programming, such as programmable logic controller programs, prepared specifically for the Project. Third-party, licensed, commercially available software is excluded from requirements of this Article; submit copies of commercially-available, licensed, third-party software, where required, in accordance with the Contract Documents.
   2. Submit on CD or portable USB "thumb drive" copies of system configuration prepared specifically for the Project, such as plant monitoring system and SCADA display configurations.
   3. Submit programming and configuration files concurrently with electronic copies of operation and maintenance data.

1.5 CONTENT

A. General:

1. Prepare each operations and maintenance manual specifically for the Project. Include in each manual all pertinent instructions, as-built drawings as applicable, bills of materials, technical bulletins, installation and handling requirements, maintenance and repair instructions, and other information required for complete, accurate, and comprehensive data for safe and proper operation, maintenance, and repair of materials and equipment furnished for the Project. Include in manuals specific information required in the Specification Section for the material or equipment, data required by Laws and Regulations, and data required by authorities having jurisdiction.
2. Completeness and Accuracy:
   a. Operation and maintenance manuals that include language stating or implying that the manual's content may be insufficient or stating that the manual's content is not guaranteed to be complete and accurate are unacceptable.
   b. Operations and maintenance manuals shall be complete and accurate.
   c. Operation and maintenance manuals shall indicate the specific alternatives and features furnished, and the specific operation and maintenance provisions for the material or equipment furnished.
3. Submit complete, detailed written operating instructions for each material or equipment item including: function; operating characteristics; limiting conditions; operating instructions for start-up, normal and emergency conditions; regulation and control; operational troubleshooting; and shutdown. Also include, as applicable, written descriptions of alarms generated by equipment and proper responses to such alarm conditions.

B. Submit written explanations of safety considerations relating to operation and maintenance procedures.

C. Submit complete, detailed, written preventive maintenance instructions including all information and instructions to keep materials, equipment, and systems properly lubricated, adjusted, and maintained so that materials, equipment, and systems function economically throughout their expected service life. Instructions shall include:
   1. Written explanations with illustrations for each preventive maintenance task such as inspection, adjustment, lubrication, calibration, and cleaning. Include pre-startup checklists for each equipment item and maintenance requirements for long-term shutdowns.
   2. Recommended schedule for each preventive maintenance task.
   3. Lubrication charts indicating recommended types of lubricants, frequency of application or change, and where each lubricant is to be used or applied.
   4. Table of alternative lubricants.
   5. Troubleshooting instructions.
   6. List of required maintenance tools and equipment.

D. Submit complete bills of material or parts lists for materials and equipment furnished. Lists or bills of material may be furnished on a per-drawing or per-equipment assembly basis. Bills of material shall indicate:

1. Manufacturer's name, address, telephone number, fax number, and Internet website address.
2. Manufacturer's local service representative's or local parts supplier's name, address, telephone number, fax number, Internet website address, and e-mail addresses, when applicable.
3. Manufacturer's shop order and serial number(s) for materials, equipment or assembly furnished.
4. For each part or piece include the following information:
    a. Parts cross-reference number. Cross-reference number shall be used to identify the part on assembly drawings, Shop Drawings, or other type of graphic illustration where the part is clearly shown or indicated.
    b. Part name or description.
    c. Manufacturer's part number.
    d. Quantity of each part used in each assembly.
    e. Current unit price of the part at the time the operations and maintenance manual is submitted. Price list shall be dated.

E. Submit complete instructions for ordering replaceable parts, including reference numbers (such as shop order number or serial number) that will expedite the ordering process.

F. Submit manufacturer's recommended inventory levels for spare parts, extra stock materials, and consumable supplies for the initial two years of operation. Consumable supplies are items consumed or worn by operation of materials or equipment, and items used in maintaining the operation of material or equipment, including items such as lubricants, seals, reagents, and testing chemicals used for calibrating or operating the equipment. Include estimated delivery times, shelf life limitations, and special storage requirements.

G. Submit manufacturer's installation and operation bulletins, diagrams, schematics, and equipment cutaways. Avoid submitting catalog excerpts unless they are the only document available showing identification or description of particular component of the equipment. Where materials pertain to multiple models or types, mark the literature to indicate specific material or equipment supplied. Marking may be in the form of checking, arrows, or underlining to indicate pertinent information, or by crossing out or other means of obliterating information that does not apply to the materials and equipment furnished.

H. Submit original-quality copies of each approved and accepted Shop Drawing, product data, and other submittal, updated to indicate as-installed condition. Reduced drawings are acceptable only if reduction is to not less than one-half original size and all lines, dimensions, lettering, and text are completely legible on the reduction.

I. Submit complete electrical schematics and wiring diagrams, including complete point-to-point wiring and wiring numbers or colors between all terminal points.

J. Programmable Logic Controllers: If programmable logic controllers are furnished

under the Contract:

1. Submit complete logic listings in ladder diagram format.
2. Format Requirements:
   a. For ladder diagram logic, include complete cross-referencing of all logic elements. Annotate all elements with clearly understandable tags or descriptive labels.
3. Submit complete programmable logic controller listing of all input/output address assignments, tag assignments, and pre-set constant values, with functional point descriptions.
4. Submit complete manufacturer's programming manuals.

K. Submit copy of warranty bond and service contract as applicable.

L. When copyrighted material is used in operations and maintenance manuals, obtain copyright holder's written permission to use such material in the operation and maintenance manual.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

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SECTION 01 78 36

WARRANTIES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This section describes general requirements for warranties required in the various Specifications.
   2. Provisions on the Contract's correction period, CONTRACTOR'S general warranty and guarantee, and CONTRACTOR's warranty of title are in the Agreement.
   2. This section includes general requirements for:
      a. Suppliers' standard warranties.
      b. Suppliers' special warranties.
      c. Implied warranties.
      d. Commencement and duration of warranties.

1.2 SUBMITTALS

A. General:
   1. For each item of material or equipment furnished under the Contract, submit Supplier's standard warranty, regardless of whether such warranty or submittal thereof is required by the associated Specifications for that item.
   2. For each item of material or equipment where Supplier's special (or extended) warranty is required by the Contract Documents, submit appropriate special warranty that complies with the Contract Documents.
   3. Supplier's warranties shall be specifically endorsed solely to CITY by the entity issuing such warranty.
   4. Submit Suppliers' standard warranties and special warranties as submittals in accordance with Schedule of Submittals accepted by ENGINEER.

1.3 SUPPLIERS' WARRANTIES FOR MATERIALS AND EQUIPMENT

A. Warranty Types:
   1. Required by the Agreement:
      a. Warranties specified for materials and equipment shall be in addition to, and run concurrent with, CONTRACTOR's general warranty and guarantee and requirements for the Contract's correction period.
      b. Disclaimers and limitations in specific materials and equipment warranties do not limit CONTRACTOR's general warranty and guarantee, nor does such affect or limit CONTRACTOR's performance obligations under the correction period.

2. Material or equipment manufacturer's standard warranty is pre-printed, written warranty published by item's manufacturer and specifically endorsed by manufacturer to CITY.
3. Special warranty is written warranty required by the Contract Documents, either to extend the duration of material or equipment manufacturer's standard warranty or to provide other, increased rights to CITY. Where the Contract Documents indicate specific requirements for warranties that differ from the manufacturer's standard warranty for that item, special warranty is implied.

B. Requirements for Special Warranties:
1. Submit written special warranty document that contains appropriate provisions and identification, ready for execution by material or equipment manufacturer and CITY. Submit draft warranty with submittals required prior to fabrication and shipment of the item from the Supplier's facility.
2. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed by product manufacturer and other entities as appropriate.
3. Specified Form: When specified forms for special warranties are included in the Contract Documents, prepare written document, properly executed by item manufacturer and CITY, using the required form.
4. Refer to the Specifications for content and requirements for submitting special warranties.

1.4 IMPLIED WARRANTIES

A. Warranty of Title and Intellectual Rights:
1. Except as may be otherwise indicated in the Contract Documents, implied warranty of title required by Laws and Regulations is applicable to the Work and to materials and equipment incorporated therein.
2. Provisions on intellectual rights, including patent fees and royalties, are in the Agreement.

B. Warranty of Merchantability:
1. Notwithstanding any other provision of the Contract to the contrary, implied warranties of merchantability required by Laws and Regulations apply to the Work, including the materials and equipment incorporated therein.

C. Warranty of Fitness-for-Purpose:
1. Implied warranty of fitness-for-purpose for materials and equipment to be incorporated into the Work is hereby disclaimed by DEPARTMENT and CONTRACTOR.
2. When Supplier is aware of, or has reason to be aware of, specified materials or features of the Work that are contrary to the intended use, purpose, service, application, or environment in which the material or equipment item will be used, submit request for interpretation in accordance with Section 01 26 00, Contract Modification Procedures. Where appropriate, such request for

interpretation shall indicate the apparent discrepancy and propose appropriate, alternative materials or equipment.

1.5 COMMENCEMENT AND DURATION OF WARRANTIES

A. Commencement of Warranties:
   1. Contract correction period and CONTRACTOR's general warranty commence as indicated in the Agreement.
   2. Suppliers' general warranties and special warranties commence running on the date that the associated item is certified by ENGINEER as substantially complete. In no event shall special warranties commence running prior to ENGINEER's review and acceptance of special warranty submittal for the item.
   3. Implied warranties commence in accordance with Laws and Regulations.

C. Duration of Warranties:
   1. Duration of correction period is in accordance with the Agreement.
   2. Duration of CONTRACTOR's general warranty and guarantee is in accordance with Laws and Regulations.
   3. Duration of Suppliers' general warranties is in accordance with the applicable general warranty document accepted by ENGINEER.
   4. Duration of required Suppliers' special warranties shall be in accordance with the requirements of the Contract Documents for the subject item.
   5. Duration of implied warranties shall be in accordance with Laws and Regulations.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

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SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes requirements for Project record documents, to supplement the requirements of the General Conditions, as may be modified by the Supplementary Conditions.
   2. CONTRACTOR shall provide all labor, materials, equipment, and services to maintain and submit to ENGINEER Project record documents in accordance with the Contract Documents.

B. Maintenance of Record Documents:
   1. Maintain in CONTRACTOR's field office, in clean, dry, legible condition, complete sets of the following record documents: Drawings, Specifications, and Addenda; Shop Drawings, Samples, and other CONTRACTOR submittals, including records of test results, approved or accepted as applicable, by ENGINEER; Change Orders, Work Change Directives, Field Orders, copies of all interpretations and clarifications issued, photographic documentation, survey data, and all other documents pertinent to the Work.
   2. Provide files and racks for proper storage and easy access to record documents. File record documents in accordance with the edition of the Construction Specification Institute's *MasterFormat*™ used for organizing the Project Manual, unless otherwise accepted by ENGINEER.
   3. Promptly make record documents available for observation and review upon request of ENGINEER or DEPARTMENT. Requirements for review of record documents status as a condition precedent to progress payments is in Section 01 29 73, Schedule of Values.
   4. Do not use record documents for any purpose other than serving as Project record. Do not remove record documents from CONTRACTOR's field office without ENGINEER's approval.

1.2 SUBMITTALS

A. Closeout Submittals: Submit the following:
   1. Record Documents:
      a. Submit the following Project record documents:
         1) Drawings.
         2) Project Manual including Specifications and Addenda (bound).
      b. Prior to readiness for final payment, submit to ENGINEER one copy of Project's final record documents and obtain ENGINEER's acceptance of

same. Submit complete record documents; do not make partial submittals.

c. Submit both printed record documents and electronic record documents, in accordance with Section 01 31 26, Electronic Communication Protocols.

d. Submit record documents with transmittal letter on CONTRACTOR letterhead in accordance with requirements in Section 01 33 00, Submittal Procedures.

2. Certifications:

a. Record documents submittal shall include certification, with original signature of official authorized to execute legal agreements on behalf of CONTRACTOR, reading as follows:

"[*Insert Contractor's corporate name*] has maintained and submitted Project record documentation in accordance with the General Conditions and Supplementary Conditions, Section 01 78 39, Project Record Documents, and other elements of Contract Documents, for the City of Newburgh GAC Treatment System at Washington Lake Filtration Plant. We certify that each record document submitted is complete, accurate, and legible relative to the Work performed under our Contract, and that the record documents comply with the requirements of the Contract Documents.

[*Provide signature, print name, print signing party's corporate title, and date*]"

1.3 RECORDING CHANGES

A. Recording Changes – General:

1. At the start of the Project, label each record document to be submitted as, "PROJECT RECORD" using legible, printed letters. Letters on record copy of the Drawings shall be two inches high.
2. Keep record documents current consistent with the progress of the Work. Make entries on record documents within two working days of receipt of information required to record the change.
3. Do not permanently conceal the Work until required information has been recorded for Project record documents.
4. Accuracy of record documents shall be such that future searches for items shown on the record documents may rely reasonably on information obtained from ENGINEER-accepted record documents.
5. Marking of Entries:

a. Use erasable, colored pencils (not ink or indelible pencil) for marking changes, revisions, additions, and deletions to record documents.

b. Clearly describe the change by graphic line and make notations as required. Use straight-edge to mark straight lines. Writing shall be legible and sufficiently dark to allow scanning of record documents into legible electronic files in portable document format (".PDF").

c. Date each entry on record documents.
d. Indicate changes by drawing a "cloud" around the change(s) indicated.
e. Mark initial revisions in red. In the event of overlapping changes, use different colors for subsequent changes.

B. Drawings:
1. Record changes on copy of the Drawings. Submittal of CONTRACTOR-originated or -produced drawings as a substitute for recording changes on a copy of the Drawings is unacceptable.
2. Record changes on plans, sections, elevations, schematics, schedules, and details as required for clarity, making reference dimensions and elevations (to Project datum) for complete record documentation.
3. Record actual construction including:
   a. Depths of various elements of foundation relative to Project datum.
   b. Horizontal and vertical location of Underground Facilities referenced to permanent surface improvements and project elevation datum. For each Underground Facility, including pipe fittings, show and indicate dimensions to not less than two permanent, visible surface improvements.
   c. Location of exposed utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure and, where applicable, to Project elevation datum.
   d. Changes in structural and architectural elements of the Work, including changes in reinforcing.
   e. Field changes of dimensions, arrangements, and details.
   f. Changes made in accordance with Addenda, Change Orders, Work Change Directives, and Field Orders.
   g. Changes in details on the Drawings. Submit additional details prepared by CONTRACTOR when required to document such changes.
4. Recording Changes for Schematic Layouts:
   a. In some cases on the Drawings, arrangements of conduits, circuits, piping, ducts, and similar items are shown schematically and are not intended to portray physical layout. For such cases, the final physical arrangement shall be determined by CONTRACTOR subject to acceptance by ENGINEER.
   b. Record on the Project record documents all revisions to schematics on the Drawings, including: piping schematics, ducting schematics, process and instrumentation diagrams, control and circuitry diagrams, electrical one-line diagrams, motor control center layouts, and other schematics when included in the Drawings. Show and indicate actual locations of equipment, lighting fixtures, in-place grounding system, and other pertinent data.
   c. When dimensioned plans and dimensioned sections or elevations on the Drawings show the Work schematically, indicate on the record documents, by dimensions accurate to within one inch in the field, centerline location of items of Work such as conduit, piping, ducts, and similar items

1) Clearly identify each item of the Work by accurate notations such as "cast iron drain", "rigid electrical conduit", "copper waterline", and similar descriptions.
2) Show by symbol or by note the vertical location of each item of the Work; for example, "embedded in slab", "under slab", "in ceiling plenum", "exposed", and similar designations. For piping not embedded, also indicate elevation dimension relative to Project elevation datum.
3) Descriptions shall be sufficiently detailed to be related to the Specifications.

d. ENGINEER may furnish written waiver of requirements relative to schematic layouts shown on plans, sections, and elevations when, in ENGINEER's judgment, dimensioned layouts of Work shown schematically will serve no useful purpose. Do not rely on such waiver(s) being issued.

5. Supplemental Drawings:
   a. In some cases, drawings produced during construction by ENGINEER or CONTRACTOR supplement the Drawings and shall be included with Project record documents submitted by CONTRACTOR. Supplemental record drawings shall include drawings or sketches that are part of Change Orders, Work Change Directives, and Field Orders and that cannot be incorporated into the Drawings because of space limitations.
   b. Supplemental drawings submitted with record drawings shall be integrated with the Drawings and include necessary cross-references between drawings. Supplemental record drawings shall be on sheets the same size as the Drawings.
   c. When supplemental drawings developed by CONTRACTOR using computer-aided drafting/design (CADD) software are to be included in record drawings, submit electronic files for such drawings in accordance with Section 01 31 26, Electronic Communication Protocols, as part of record drawing submittal. Label such files, "Supplemental Record Drawings", including with CONTRACTOR's name, Project name, and Contract designation.

C. Specifications and Addenda:
   1. Mark each Specifications Section to record:
      a. Manufacturer, trade name, catalog number, and Supplier of each material and equipment item actually provided.
      b. Changes made by Addendum, Change Orders, Work Change Directives, and Field Orders.

1.4 ELECTRONIC FILES FURNISHED BY ENGINEER

A. CADD files of the Drawings will be furnished by ENGINEER upon the following conditions:
   1. CONTRACTOR shall submit to ENGINEER a letter on CONTRACTOR letterhead requesting CADD files of the Drawings and indicating specific definition(s) or description(s) of how such files will be used, and specific description of benefits to DEPARTMENT (including credit proposal, if applicable) if the request is granted.
   2. CONTRACTOR shall execute ENGINEER's standard agreement for release of electronic files and shall abide by the provisions of such agreement for release of electronic files.
   3. Layering system incorporated in CADD files shall be maintained as transmitted by ENGINEER. CADD files transmitted by ENGINEER containing cross-referenced files shall not be bound by CONTRACTOR. Drawing cross-references and paths shall be maintained. If CONTRACTOR alters layers or cross-reference files, CONTRACTOR shall restore all layers and cross-references prior to submitting record documents to ENGINEER.
   4. CONTRACTOR shall submit record drawings to ENGINEER in same CADD format that files were furnished to CONTRACTOR.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

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SECTION 01 78 43

SPARE PARTS AND EXTRA MATERIALS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes administrative and procedural requirements for furnishing spare parts, extra materials, maintenance supplies, and special tools required for maintenance (collectively, "spare parts and extra materials") required by the Contract Documents.
   2. CONTRACTOR shall furnish spare parts, extra materials, and associated information, for materials and equipment furnished in accordance with the Contract Documents. Furnish such items in accordance with the requirements of this Section and the Specifications sections in which such items are indicated.
   3. CONTRACTOR shall be fully responsible for loss and damage to spare parts and extra materials until such items are received by CITY.
   4. Promptly replace spare parts and extra materials furnished by CITY to CONTRACTOR for use in remedying defective Work.

B. List of Spare Parts and Extra Materials:
   1. With the Shop Drawings and product data submittals for each Specifications section, submit a complete listing of spare parts and extra materials required for maintenance for two years of operation, together with unit prices in current United States funds, and source(s) of supply for each.
   2. Also include listing of spare parts and extra materials, with pricing and sources, in the operations and maintenance data submitted in accordance with Section 01 78 23, Operations and Maintenance Data.

1.2 SUBMITTALS

A. Maintenance Material Submittals: Submit the following:
   1. Spare Parts and Extra Materials:
      a. Furnish to CITY in accordance with requirements of this Section, and the Specifications section in which the spare parts and extra materials are specified.
   2. Transfer Documentation: For each delivery of spare parts and extra materials, submit to ENGINEER the following:
      a. Submit, on CONTRACTOR's letterhead, a letter of transmittal for spare parts and extra materials furnished under each Specifications section. Letter of transmittal shall accompany spare parts and extra materials. Do

not furnish letter of transmittal separate from associated spare parts and extra materials.

b. Furnish three original, identical, signed letters of transmittal for each delivery of spare parts and extra materials furnished under each Specifications section. Upon delivery of specified quantities and types of spare parts and extra materials to CITY, designated person from CITY will countersign each original letter of transmittal indicating CITY's receipt of spare parts and extra materials in the quantity, type, and quality required by the Contract Documents. CITY will retain one fully-signed original, CONTRACTOR shall submit one fully-signed original to ENGINEER. CONTRACTOR shall retain one fully-signed original for CONTRACTOR's records.

c. Letter of transmittal shall include the following:
   1) Information required for letters of transmittal in Section 01 33 00, Submittal Procedures.
   2) Transmittal shall list spare parts and extra materials furnished under each Specifications Section. List each individual part, material, equipment item, tool, and product and the associated quantity furnished.
   3) Include space for countersignature by CITY as follows: space for signature, space for printed name, and date.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Packaging and Labeling of Spare Parts and Extra Materials:
   1. Furnish spare parts and extra materials in manufacturer's unopened cartons, boxes, crates, or other original, protective covering suitable for preventing corrosion and deterioration for maximum length of storage normally anticipated by manufacturer.
   2. Packaging of spare parts and extra materials shall be clearly marked and identified with name of manufacturer, applicable material or equipment, part number, part description, and part location in the equipment or system.
   3. Protect and package spare parts and extra materials for maximum shelf life normally anticipated by manufacturer.

B. Storage Prior to Delivery to Owner:
   1. Prior to furnishing spare parts and extra materials to CITY, store spare parts and extra materials in accordance with the Contract Documents and manufacturers' recommendations.

C. Procedure for Delivery to Owner:
   1. Deliver spare parts and extra materials to CITY's permanent storage rooms at the Site or area(s) at the Site designated by CITY.
   2. When spare parts and extra materials are delivered, CONTRACTOR and CITY will mutually inventory the spare parts and extra materials delivered to verify

compliance with the Contract Documents regarding quantity, part numbers, and quality.

3. Additional procedures for delivering spare parts and extra materials to CITY, if required, will be developed by ENGINEER and complied with by CONTRACTOR.
4. CONTRACTOR shall reimburse DEPARTMENT for all costs and expenses incurred by DEPARTMENT, including professional services, for delivery of inadequate, incorrect, or defective spare parts and extra materials. DEPARTMENT may withhold such amounts from payments due CONTRACTOR via set-offs in accordance with the Contract Documents.

D. Delivery Time and Eligibility for Payment:
   1. Deliver to OWNER spare parts and extra materials prior to date of Substantial Completion for materials and equipment associated therewith.
   2. Do not deliver spare parts and extra materials before commencing startup for associated material or equipment.
   2. Spare parts and extra materials are not eligible for payment until delivered to DEPARTMENT and CONTRACTOR's receipt of OWNER's countersignature on letter of transmittal.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

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SECTION 01 79 13

SYSTEM AND FACILITY PERFORMANCE TESTING PROCEDURES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes requirements for operation of specific systems or facility by CONTRACTOR and associated performance testing.
   2. CONTRACTOR shall provide all labor, materials, services, equipment, and incidentals required for performance testing as indicated in the Contract Documents.
   3. Perform required performance testing for each item of process; mechanical; instrumentation and control; plumbing; heating, ventilating, and air conditioning (HVAC); electrical systems and equipment; and other systems and equipment; as indicated in Table 01 79 13-A of this Section, to demonstrate compliance with the performance requirements of the Contract Documents.
   4 Objectives of performance testing are to:
      a. Demonstrate to satisfaction of DEPARTMENT and ENGINEER that structures, systems, materials, and equipment tested comply with all functional and performance requirements in the Contract Documents.
      b. Demonstrate that facility, or designated portion thereof, is substantially complete.
      c. Establish baseline operating conditions for CITY's use in establishing standard operating procedures and preventative maintenance programs.
   5. Utilities and Consumables:
      a. CONTRACTOR shall provide the following: electricity, fuel, compressed air, chemicals, temporary piping and appurtenances, and all other items, work, and services required for completing performance testing.
      b. CITY will provide the following: water, for initial performance testing. CONTRACTOR shall provide temporary piping and appurtenances required to convey to the testing location utilities and consumables furnished by DEPARTMENT. If re-testing is required, cost of utilities and consumables furnished by CITY OR DEPARTMENT for initial testing shall be paid by CONTRACTOR at CITY's or DEPARTMENT's cost or standard rates, as applicable. DEPARTMENT may deduct such costs from payments due CONTRACTOR as set-offs, in accordance with the Contract Documents.
   6. Sequence: The following general sequence applies to performance testing required under this Section:
      a. Furnish submittals required prior to performance testing, in accordance with this Section.

b. Complete the Work associated with starting and placing equipment in operation.
c. To the extent practicable, complete field quality control Work, including testing at the Site, specified in Specifications Sections for individual materials, equipment items, and systems.
d. Perform the performance testing in accordance with this Section, simulating the range of actual operating conditions to the greatest extent possible.
e. Successful completion of performance testing is required to achieve Substantial Completion.

B. Coordination:
1. Review procedures under this and other Sections and coordinate installation and testing of items that will be started up and tested with or before performance testing Work.

1.2 TERMINOLOGY

A. The following words or terms are not defined but, when used in this Section, have the following meaning:
1. A "system" includes all required items of materials, equipment, devices, and appurtenances connected so that their operation or function complements, protects, or controls the operation or function of the others.

1.3 QUALITY ASSURANCE

A. Qualifications:
1. CONTRACTOR is Performance Testing Manager:
a. Appoint a performance testing manager, who shall:
1) Manage, coordinate, and supervise CONTRACTOR'S performance testing.
2) Assist in coordinating and documenting field quality control Work specified in individual Specifications Sections.
3) Prepare, or review and approve, all submittals for the Work under this Section.
4) Assist in coordinating activities of SubContractors and Suppliers relative to performance testing.
5) Possess a valid water treatment plant operator's license issued by the authority having jurisdiction.
6) Make frequent visits to the Site during performance testing.
b. Experience:
1) Performance testing manager shall be an operations ENGINEER or a qualified operations specialist, having not less than five years of experience in work similar to that required, or experience on not less than five separate projects, in managing performance testing of process, mechanical, instrumentation and control, HVAC, and

electrical systems similar in scope and extent to those to be performance-tested under the Project.

2) Operations ENGINEER: Shall be a graduate of four-year course in mechanical or civil engineering at an accredited college or university.

3) Operations Specialist: Shall have equivalent experience in operation and maintenance of facility similar to the systems and facility to be performance-tested under the Project.

B. Pre-performance Testing Conference:

1. General:
   a. After initial submittal of documentation plan and performance testing plan and prior to starting performance testing, arrange a meeting at the Site.
   b. Record discussions of conference and decisions and agreements and disagreements and furnish a copy of record to each party attending.
2. Required Attendees:
   a. CONTRACTOR'S performance testing manager.
   b. CONTRACTOR'S other key personnel.
   c. Material and equipment Suppliers' technical representatives.
   d. Authorities having jurisdiction over operating permit(s).
   e. Utility owners (when necessary).
   f. ENGINEER.
   g. DEPARTMENT.
   h. CITY.
   i. New York State Department of Health.
   j. Orange County Health Department.
   k. Other representatives directly concerned with performance testing Work.
3. At pre-performance testing conference, review foreseeable methods and procedures relating to performance testing Work including:
   a. Review Project requirements including Contract Documents, submittals related to performance testing, interpretations and clarifications relative to performance testing, and other pertinent documents.
   b. Review required submittals, both completed and to be completed.
   c. Review status of the equipment and systems to be performance-tested and work to be completed prior to commencing performance testing.
   d. Review Progress Schedule and testing schedule.
   e. Review status of utilities and consumables required for performance testing.
   f. Review required observations, inspections, testing, certifying, and quality control procedures.
   g. Review methods for complying with Laws and Regulations and requirements of authorities having jurisdiction, such as compliance with facility operating permit requirements, insurance requirements, environmental protection, health, safety, fire, and similar regulations.
4. Reconvene the conference at earliest opportunity if additional information must be developed to conclude the conference's required topics.

5. Record revisions or changes agreed upon, reasons therefor, and entities agreeing or disagreeing with them.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Documentation plan, in accordance with Article 1.5 of this Section.
   2. Performance testing plans, in accordance with Article 1.5 of this Section.

B. Informational Submittals: Submit the following:
   1. Records of pre-performance testing conference.
   2. Testing schedules, in accordance with Article 1.5 of this Section.
   3. Notices: Written notice to ENGINEER and DEPARTMENT not less than 72 hours prior to beginning each performance test.
   4. Field Quality Control Submittals: All records produced during, and results of, performance testing.
   5. Qualifications Statements:
      a. Testing laboratory qualifications and certifications, if not previously submitted and accepted under other Sections.
      b. Qualifications of CONTRACTOR'S performance testing manager and other required performance testing personnel, including copies of valid operators' licenses issued by authorities having jurisdiction.

1.5 DOCUMENTATION PLAN, PERFORMANCE TESTING PLAN, AND TESTING SCHEDULE

A. Documentation Plans: Develop recordkeeping system to document compliance with requirements of this Section and authorities having jurisdiction. Documentation plan shall include:
   1. Calibration documentation including identification (by make, manufacturer, model, and serial number) of all test equipment, date of original calibration, date(s) of subsequent calibrations, calibration method, and test laboratory verifying calibration.
   2. Documentation to be furnished for each material, equipment item, and system to be tested shall include date of test, material designation, equipment tag number or system name, nature of test, test objectives, test results, test instruments employed, and signature spaces for CONTRACTOR'S performance testing manager and DEPARTMENT'S and ENGINEER'S witnesses. Establish separate electronic (and, where applicable, paper) file for each system and equipment item to be tested. Files shall include the following information, as applicable, when associated tests, source quality control, or field quality control measures are required in the Contract Documents:
      a. Metallurgical tests, when required.
      b. Source quality control (factory) tests.
      c. Accelerometer recordings made during shipment, when such recordings are required.

d. Field calibration tests, in accordance with the Contract Documents.
e. Field hydrostatic tests for materials, equipment, and systems that operate under pressure, in accordance with the Contract Documents.
f. Other field quality control testing, in accordance with the Contract Documents

3. Forms:
   a. Develop forms specific to each item of materials, equipment, and system being tested, to document results of testing.
   b. Furnish forms approved by ENGINEER in sufficient quantity to document all testing Work.

B. Performance Testing Plans:
1. Develop performance testing plans describing in detail coordinated, sequential performance testing of each material, equipment item, and system to be performance-tested under this Section. Each performance testing plan shall be specific to the material, equipment item, and system to be performance-tested, and shall identify by specific equipment or tag number each device or control station to be manipulated or observed during performance testing, and specific results to be observed or obtained. Performance testing plans shall be specific regarding support systems required to complete the performance testing Work, temporary devices and systems required (if any) during performance testing, SubContractors and Suppliers to be present during performance testing, and planned performance testing duration.
2. Performance testing plans shall include:
   a. Summary of startup, checkout, and field quality control testing required for each material, equipment item, and system to be performance-tested, prior to starting performance testing.
   b. Calibration of all field instruments and control devices.
   c. Description of and information on temporary systems, equipment, and devices proposed for performance testing, including calibration data for temporary instrumentation and controls.
   d. Plan and procedures for implementing performance testing of materials, equipment items, and systems. Performance tests shall duplicate 100 percent the operating conditions described in the Contract Documents.
   e. Description of data reduction required, if any, and proposed time between collection of data and submittal of results to ENGINEER.
   f. Summary of criteria for acceptance of test results. Summary shall include performance tolerances (if any) included in the Contract Documents. Where performance tolerances are not included in the Contract Documents, testing plan shall include proposed performance tolerances. Where CONTRACTOR-proposed performance tolerances are proposed to and accepted by ENGINEER and DEPARTMENT, said tolerances shall be binding on the parties as criteria upon which acceptability of performance testing results will be evaluated.
3. Performance testing plans shall contain complete description of proposed procedures to achieve desired testing environment.

4. As condition precedent to receiving progress payments in excess of 85 percent of the Contract Price, or progress payments due CONTRACTOR eight weeks in advance of proposed date CONTRACTOR intends to begin performance testing Work (whichever occurs earlier), submit in approvable form all required performance testing plans.
5 Following ENGINEER'S approval of performance testing plans, CONTRACTOR shall reproduce performance testing plans in sufficient quantity for CONTRACTOR'S purposes plus five copies to ENGINEER and five copies to DEPARTMENT. Do not start performance testing until required quantity of approved performance testing plans is provided.

C. Testing Schedule:
1. Prepare and submit a testing schedule that sets forth the planned sequence for performance testing Work.
2. Testing schedule shall be a subset of the Progress Schedule and shall comply with the Contract Documents' requirements for the Progress Schedule, except as otherwise specified in this Section.
3. Test schedule shall:
a. Detail the materials, equipment items, and systems to be performance-tested, and the testing duration required for each.
b. Show and indicate planned start date, duration, and completion of each performance test and related activities.
c. Submitted not later than 28 days prior to the date performance testing is to begin. ENGINEER will not witness performance testing Work until test schedule is submitted to and accepted by ENGINEER.
d. Be updated and resubmitted to ENGINEER not less than weekly. Updates shall indicate actual dates of performance testing Work, indicating systems and equipment for which performance testing is in progress, and that are satisfactorily completed in accordance with the Contract Documents and the previously-approved submittals furnished under this Section.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 PREPARATION

A. Before starting the performance testing under this Section, complete the following:
1. Prepare and align equipment in accordance with equipment Specifications and Section 01 73 19, Installation.
2. To the extent practicable, complete equipment tests and checkout in accordance with the Contract Documents and manufacturers' recommendations.

3. Complete other tests required by the Contract Documents, including instrumentation and controls calibration and testing, piping tests, electrical tests, and other tests required prior to full operation of the system or facility.
4. Complete the Work required in Section 01 75 11, Checkout and Startup Procedures, for the materials, equipment items, and systems to be performance-tested under this Section.

B. Temporary Systems and Devices Required for Performance Testing:
1. Minimize the need for temporary systems and devices required for performance testing under this Section.
2. Provide temporary connections and bulkheads as required, and make other provisions to recirculate process fluids and gasses as required, or otherwise simulate the range of anticipated operating conditions for the materials, equipment items, and systems being tested. During performance testing, CONTRACTOR'S performance testing manager and team shall monitor the characteristics of each material, equipment item, and system being tested and report unusual conditions to ENGINEER.
3. Properly install temporary systems. Test temporary equipment and devices in accordance with manufacturer's instructions to verify suitability for use in performance testing. Test temporary piping in accordance with requirements for associated permanent piping.
4. Calibration and Loop Testing of Temporary Instruments and Controls: Calibrate and test all loops and associated instruments and control devices, in accordance with instrumentation and controls Sections of Division 40 and other applicable provisions of the Contract Documents.

3.2 PERFORMANCE TESTING

A. CONTRACTOR'S performance testing manager shall organize teams comprising qualified representatives of Suppliers, SubContractors, CONTRACTOR'S independent testing laboratory (if applicable), and others as appropriate, to efficiently complete performance testing Work within the Contract Times and in accordance with the accepted Progress Schedule.

B. Performance testing shall be done in accordance with the approved performance testing plan, approved documentation plan, and accepted testing schedule. Performance-test the systems and equipment items indicated in Table 01 79 13-A of this Section.

C. System Performance Tests:
1. Testing:
a. Duration:
1) Operate and performance-test the system (or each portion thereof, as applicable) and equipment for 15 days to determine: operating characteristics of materials, equipment, and systems, including noise,

temperatures, and vibration; observe its performance characteristics; and for adjustment of controls and appurtenances.

2) The minimum duration of performance testing for each system or equipment item shall be the number of continuous and consecutive days specified in Table 01 79 13-A in this Section. Indicate the proposed performance testing duration in the testing plan and testing schedule.

3) Duration of performance testing shall be in accordance with the approved testing plan and accepted testing schedule.

b. When testing requires availability of temporary systems such as temporarily "looped" piping, temporary or standby electrical power, temporary compressed air, or temporary instrumentation and controls, provide acceptable alternate sources that meet the requirements of system and equipment being tested.

c. Disposal site for test media that will contain Constituents of Concern or that have the potential, upon disposal, to create a Hazardous Environmental Condition, are subject to review and acceptance by DEPARTMENT and ENGINEER.

d. During performance testing, CONTRACTOR shall obtain baseline operating data on equipment with motors greater than one horsepower. Baseline data shall include amperage, bearing temperatures, and vibration data obtained at intervals in the approved testing plan. Methods of measurement shall be in accordance with industry standards applicable for the motors being tested.

2. Test Interruption: Should testing be halted for any reason, repeat the performance testing until specified continuous testing period is completed for the material, equipment item, or system without interruption, in accordance with the Contract Documents.

3. Test Results and Re-testing: The following applies to the entire system tested and to portions thereof:

a. Successful test results shall indicate compliance with the Contract Documents. If performance tolerances are not specified in the Contract Documents, test results shall comply with tolerances established in testing plan submittal approved by ENGINEER.

b. When results of performance testing fail to comply with the Contract Documents regarding such test, CONTRACTOR shall make adjustments and repairs as required and shall repeat the tests as required until compliance with the Contract Documents is achieved.

c. Re-testing Because of Disputed Testing Results or Procedures: In the case of an otherwise satisfactory performance test, when there is doubt, disagreement, or difference between ENGINEER and CONTRACTOR regarding testing results, methods, or equipment used in performance testing, ENGINEER may order CONTRACTOR to repeat the testing. If repeat testing using such modified methods or equipment required by ENGINEER confirms the previous test, all costs of repeat test will be paid by DEPARTMENT. Otherwise all costs, including costs of

engineering, labor, testing agencies, inspections, and other performance testing-related costs shall be paid by CONTRACTOR.

4. Post-test Inspection: After completing performance testing, check materials, equipment, and systems for proper alignment and realign as required. Check equipment for loose connections, unusual movement, and other indication of improper operating characteristics or improper installation. Disassemble and inspect equipment and devices that exhibit unusual or unacceptable operating characteristics. Repair or replace defective Work in accordance with the Contract Documents at no additional cost to DEPARTMENT

3.3 REQUIRED PERFORMANCE TESTING

A. The schedules listed below, following this Section's "End of Section" designation, are a part of this Specifications Section.
   1. Table 01 79 13-A, Required Performance Testing.

+ + END OF SECTION + +

TABLE 01 79 13-A, REQUIRED PERFORMANCE TESTING

Name of System or Principal Equipment to be Performance-Tested	Appurtenant or Associated Systems or Equipment (1)	Performance Testing Minimum Duration	Systems or Equipment to be Tested Concurrently with this System (2)	Remarks
High Lift Pumps	GAC control systems	12 hours	N/A	Test equipment to ensure operational functionality in automatic mode of operation.
GAC Feed Pump No.1	GAC control systems	12 hours	NA	Test equipment to ensure operational functionality in automatic mode of operation.
GAC Feed Pumps, GAC Contactors, High Lift Pumps	GAC control systems	14 days	NA	Test equipment to ensure operational functionality in automatic mode of operation.
Ductless Split-System Air-Conditioners	Indoor air conditioning units, outdoor condensing units and control systems	24 hours	N/A	Test equipment during summer design cooling day.
Electric Unit Heaters	Electric unit heaters and thermostats	24 hours	N/A	Test equipment during winter design heating day.
Vacuum Vented Gas Radiant Heaters	Burners, vacuum pumps, radiant tubing and control system	24 hours	N/A	Test equipment during winter design heating day.
Desiccant Dehumidification Unit	Desiccant dehumidification unit and control system	24 hours	N/A	Test equipment during summer design dew point day.

Notes:

(1) The appurtenant or associated systems or equipment listed in this column may not completely name all systems or equipment associated with the operation of the principal system or equipment being performance-tested. Performance-test all appurtenant systems and equipment associated with the principal system or equipment, when the appurtenant system or equipment is required for operation of the principal system or equipment being performance-tested.

(2) Performance-test all appurtenant systems and equipment associated with the principal system or equipment being performance-tested and the additional systems or equipment listed in this column.

SECTION 01 79 23

INSTRUCTION OF OPERATIONS AND MAINTENANCE PERSONNEL

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall furnish services of Supplier's operation and maintenance training specialists to instruct CITY's personnel in recommended operating and maintenance procedures for materials and equipment furnished, in accordance with the Contract Documents.
   2. Supplier shall provide a combination of classroom and field training at the Site, unless otherwise required elsewhere in the Contract Documents.
   3. CITY reserves the right to record training sessions on video for CITY's later use in instructing CITY's personnel.

B. Scheduling of Training Sessions:
   1. General:
      a. CONTRACTOR shall coordinate training services with start-up and initial operation of materials and equipment on days and times, and in manner, acceptable to CITY, in accordance with the Contract Documents.
      b. Training may be required outside of normal business hours to accommodate schedules of operations and maintenance personnel. Furnish training services at the required days and times at no additional cost to DEPARTMENT.
   2. Prerequisites to Training:
      a. Training of facility operations and maintenance personnel shall commence after preliminary operation and maintenance data has been submitted and accepted by ENGINEER, and Work required in Section 01 75 11, Checkout and Startup Procedures, 100 percent is complete.
      b. At option of DEPARTMENT or ENGINEER, training may be allowed to take place before, during, or after equipment startup.
   3. Training Schedule Submittal:
      a. Training Schedule Required: CONTRACTOR shall prepare and submit proposed training schedule for review and acceptance by ENGINEER and DEPARTMENT. Proposed training schedule shall show and indicate all training required in the Contract Documents, and shall demonstrate compliance with specified training requirements relative to number of hours of training for various elements of the Work, number of training sessions, and scheduling.
      b. Timing of Training Schedule Submittal: Submit initial training schedule not less than 60 days before scheduled start of first training session. Submit final training schedule, incorporating revisions in accordance with

ENGINEER'S comments, not later than 30 days prior to starting the first training session.

c. CITY reserved the right to modify personnel availability for training in accordance with process or emergency needs at the facility.

1.2 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer's Instructors:
   a. Shall be factory-trained by manufacturer of material or equipment.
   b. Manufacturer's instructors shall be proficient and experienced in performing training of the type required.
   c. Instructors shall be proficient in spoken and written English language.
   d. Qualifications of instructors are subject to acceptance by ENGINEER. If ENGINEER does not accept qualifications of proposed instructor, furnish services of replacement instructor with acceptable qualifications.

B. Training Scheduling Conference:

1. Prior to preparing initial training schedule submittal, schedule and hold training scheduling conference at the location where progress meetings are held, to review:
   a. Training requirements indicated in the Contract Documents.
   b. Work to be completed prior to starting training.
   c. Work progress and Progress Schedule relative to startup and training.
   d. Scheduling constraints for CITY's personnel, relative to days and times of training sessions.
   e. Preferred days for training.
   f. Location where training will be performed and facilities available.
   g. Required submittals relative to training.
   h. Other issues relative to training of operations and maintenance personnel.
2. Attendance is mandatory for the following:
   a. CONTRACTOR'S project manager.
   b. CONTRACTOR'S Site superintendent.
   c. Project manager of SubContractors responsible for furnishing materials and equipment for which training of operations and maintenance personnel is required.
   d. Manufacturers and other Suppliers invited by CONTRACTOR.
   e. ENGINEER.
   f. CITY's staff responsible for training coordination, and staff responsible for scheduling operations and maintenance personnel.
3. If additional information must be developed to adequately cover agenda items, reconvene conference as soon as possible.
4. CONTRACTOR shall prepare minutes summarizing the discussions of conference, decisions made, and agreements and disagreements, and submit the minutes to each conference attendee.

1.3 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Training Schedule: Detailed schedule of training sessions, demonstrating compliance with number of training sessions, hours required in the Contract Documents, and complying with the Contract Times. Submit training schedule submittals in accordance with time frames specified in this Section.

B. Informational Submittals: Submit the following:
   1. Lesson Plan: Acceptable lesson plan for training on each material or equipment item, in accordance with Table 01 79 23-A and the Contract Documents. Lesson plan shall comply with requirements of this Section as may be supplemented by Specifications Sections where materials and equipment are specified. Include with lesson plan copy of handouts that will be used during training sessions. Furnish lesson plan submittals in accordance with time frames specified in this Section.
   2. Qualifications:
      a. Credentials of manufacturer's proposed operations and maintenance instructor(s). Credentials shall demonstrate compliance with requirements of this Section and shall include brief resume' and specific details of instructor's operating, maintenance, and training experience relative to the specific material and equipment for which instructor will provide training.
   3. Minutes of training scheduling conference.

C. Closeout Submittals: Submit the following:
   1. Trainee sign-in sheets for each training session. Submit to CITY's training coordinator with copy to ENGINEER.

1.4 LESSON PLAN

A. Supplier's lesson plan shall describe specific instruction topics, system components for which training will be furnished, and training procedures. Handouts, if any, to be used in training shall be included with the lesson plan. Describe in lesson plan "hands-on" demonstrations planned for training sessions.

B. Submit acceptable lesson plan not less than 14 days prior to starting associated training.

C. Indicate in lesson plan estimated duration of each training segment.

D. Lesson plan shall include the following:
   1. Material and Equipment Overview (required for all types of operations and maintenance training):
      a. Describe material and equipment's operating (process) function and performance objectives.

b. Describe material and equipment's fundamental operating principles and dynamics.
c. Identify equipment's mechanical, electrical, and electronic components and features. Group related components into subsystems and describe function of subsystem and subsystem's interaction with other subsystems.
d. Identify all support materials and equipment associated with operation of subject equipment, such as air intake filters, valve actuators, motors, and other appurtenant items and equipment.
e. Identify and describe safety precautions and potential hazards related to operation.
f. Identify and describe in detail safety and control interlocks.

2. Operations Personnel Training:
   a. Material and Equipment Overview: As described in Paragraph 1.4.D.1 of this Section.
   b. Operation:
      1) Describe operating principles and practices.
      2) Describe routine operating, startup, and shutdown procedures.
      3) Describe abnormal or emergency startup, operating, and shutdown procedures that may apply.
      4) Describe alarm conditions and responses to alarms.
      5) Describe routine monitoring and recordkeeping procedures.
      6) Describe recommended housekeeping procedures.
   c. Troubleshooting:
      1) Describe how to determine if corrective maintenance or an operating parameter adjustment is required.
3. Mechanical Maintenance Training:
   a. Material and Equipment Overview: As described in Paragraph 1.4.D.1 of this Section.
   b. Material and Equipment Preventive Maintenance:
      1) Describe preventative maintenance inspection procedures required to:
         a) Inspect materials and equipment in operation.
         b) Identify potential trouble symptoms and anticipate breakdowns.
         c) Forecast maintenance requirements (predictive maintenance).
      2) Define recommended preventative maintenance intervals for each component.
      3) Describe lubricant and replacement part recommendations and limitations.
      4) Describe appropriate cleaning practices and recommend intervals.
      5) Identify and describe use of special tools required for maintenance of materials and equipment.
      6) Describe component removal, installation, and disassembly and assembly procedures.
      7) Perform "hands-on" demonstrations of preventive maintenance procedures.

8) Describe recommended measuring instruments and procedures, and provide instruction on interpreting alignment measurements, as appropriate.
9) Define recommended torqueing, mounting, calibrating, and aligning procedures and settings, as appropriate.
10) Describe recommended procedures to check and test equipment following corrective maintenance.

c. Equipment Troubleshooting:
1) Define recommended systematic troubleshooting procedures.
2) Provide component-specific troubleshooting checklists.
3) Describe applicable materials and equipment testing and diagnostic procedures to facilitate troubleshooting.
4) Describe common corrective maintenance procedures with "hands-on" demonstrations.

4. Instrumentation/Controls and Electrical Maintenance Training:
a. Materials and Equipment Overview: As described in Paragraph 1.4.D.1 of this Section.
b. Preventative Maintenance and Troubleshooting of Other Electrical Systems: In accordance with requirements for Paragraph 1.4.D.3 of this Section.

1.5 TRAINING AIDS

A. Manufacturer's instructor shall incorporate training aids as appropriate to assist in the instruction. Furnish handouts of text, tables, graphs, and illustrations as required. Other appropriate training aids include:
1. Audio-visual aids, such as videos, Microsoft PowerPoint presentations, overhead transparencies, posters, drawings, diagrams, catalog sheets, or other items.
2. Equipment cutaways and samples, such as spare parts and damaged equipment.
3. Tools, such as repair tools, customized tools, and measuring and calibrating instruments.

B. Handouts:
1. Manufacturer's instructor shall distribute and use descriptive handouts during training. Customized handouts developed especially for training for the Project are encouraged.
2. Photocopied handouts shall be good quality and completely legible.
3. Handouts should be coordinated with the instruction, with frequent references made to the handouts.
4. Provide not less than 15 copies of each handout for each training session.

C. Audio-visual Equipment: Training provider shall provide audio-visual equipment required for training sessions. If suitable equipment is available at the Site, CITY may make available CITY's audio-visual equipment; however, do not count on CITY

providing audio-visual equipment. Audio-visual equipment that training provider shall provide, as required, includes:

1. Laptop computer, presentation software, and suitable projector.
2. As required, extension cords and spare bulb for projector.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 TRAINING DELIVERY

A. Training Delivery – General:
   1. Instructors shall be fully prepared for the training sessions. Training delivery shall be communicative, clear, and proceed according to lesson plan accepted by ENGINEER, with lesson content appropriate for trainees. If DEPARTMENT or ENGINEER deems that training delivery does not to comply with the Contract Documents, training shall be postponed, rescheduled, and re-performed in acceptable manner at no additional cost to DEPARTMENT.
   2. Trainee Sign-in Sheets: In format acceptable to DEPARTMENT, furnish sign-in sheet for trainees for each session. Sign-in sheets shall include the Project name, equipment or system for which training was furnished, and type of training (e.g., operations, mechanical maintenance, instrumentation/controls maintenance, or other), and name of each trainee. Upon completion of training, submit copy of each sign-in sheet as indicated in Article 1.3 of this Section.

B. "Hands-on" Demonstrations:
   1. Manufacturer's instructor shall present "hands-on" demonstrations of operations and maintenance of materials and equipment for each training session, in accordance with lesson plan accepted by ENGINEER.
   2. CONTRACTOR and manufacturer shall furnish tools necessary for demonstrations.

3.2 TRAINING SCHEDULE

A. Manufacturer shall furnish not less than the hours of training and number of sessions indicated in Table 01 79 23-A of this Section. Travel time and expenses are responsibility of manufacturer and are excluded from required training time indicated in the Contract Documents.

B. Shifts and Training Sessions Required:

1. Operations at the Site take place 24 hours per day, divided into three shifts as follows: day, evening, and night shift.
2. Training Sessions per Shift:
   a. Operators: Maximum training per day is four hours; sessions longer than four hours shall be spread over multiple, preferably consecutive, days. Provide identical training sessions as follows:
      1) Two identical sessions during day shift, each session in a different week.
      2) One session during evening shift.
      3) One session during night shift.
   b. Mechanical Maintenance: Provide two identical training sessions during day shift, each session in a separate week, for indicated equipment. Maximum training per day is four hours; sessions longer than four hours shall be spread over multiple, preferably consecutive, days.
   c. Instrument/Controls and Electrical Maintenance: Provide two identical training sessions during day shift, each session in a separate week, for indicated equipment. Maximum training per day is four hours; sessions longer than four hours will be spread over multiple, preferably consecutive, days.

TABLE 01 79 23-A, TRAINING SUMMARY TABLE

Material or Equipment	Specification Section	Total Training Time (hours)	Number of Training Sessions Required		
			Operations	Mechanic Maint.	Instrument/ Controls & Electrical Maint.
Ductless Split-System Air-Conditioners	23 81 26	16	2	2	2
Electric Unit Heaters	23 82 39.43	8	2	2	2
Vacuum Vented Gas Radiant Heaters	23 83 26.01	16	2	2	2
Desiccant Dehumidification Units	23 84 19	16	2	2	2
Switchboards	26 24 13	4	2		2
Enclosed Circuit Breakers	26 28 17	4	2		2
Low-Voltage VFDs	26 29 23	8	2		2
Engine Generators	26 32 13	8	2		2
Automatic Transfer Switches	26 36 23	8	2		2
Fire Detection and Alarm System	28 31 00	8	2		2
Process Valves	40 05 53	16	2	2	2
Primary Sensors/Transducers and Field Instruments	40 60 05	24	2	2	2
GAC Control Panel	40 60 05	12	2	2	2
Head House Control Panel	40 60 05	12	2	2	2
Hoists	41 22 23	4	2	2	

High Lift Pumps	43 21 13.12	8	2	2	2
GAC Feed Pumps	43 21 13.23	8	2	2	2

+ + END OF SECTION + +

SECTION 02 41 00

DEMOLITION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified and required for demolition, removal, and disposal Work.
   2. The Work under this Section includes, but is not necessarily limited to:
      a. Demolition and removal of existing materials and equipment as shown or indicated in the Contract Documents. The Work includes demolition of structural concrete, foundations, walls, doors, windows, structural steel, metals, roofs, masonry, attachments, appurtenances, piping, electrical and mechanical systems and equipment, paving, curbs, sidewalks, gutters, fencing and similar existing facilities.
      b. Demolition and removal of all Underground Facilities underneath, and above-grade piping and utilities in, the building(s) and structures shown or indicated for demolition, unless the Underground Facilities or above-grade facilities are shown or indicated as to remain.
      c. Remove from slabs, foundations, walls, and footings that are to be demolished all utilities and appurtenances embedded in such construction.
   3. Demolitions and removals specified under other Sections shall comply with requirements of this Section.
   4. Perform demolition Work within areas shown or indicated.
   5. Pay all costs associated with transporting and, as applicable, disposing of materials and equipment resulting from demolition.

B. Coordination:
   1. Comply with Section 01 14 16, Coordination with CITY's Operations.
   2. Review procedures under this and other Sections and coordinate the Work that will be performed with or before demolition and removals.
   3. Notify other contractors in advance of demolition and removals Work to provide other contractors with sufficient time for performing work and coordinating items included in their contracts that will be performed before or in conjunction with demolition and removals Work.

C. Related Sections:
   1. Section 31 23 16.26, Rock Removal.
   2. Section 33 11 00, Clearing and Grubbing.

1.2 QUALITY ASSURANCE

A. Qualifications:
   1. Electrical Removals: Entity and personnel performing electrical removals shall be electrician legally qualified to perform electrical construction and electrical work in the jurisdiction where the Site is located.

B. Regulatory Requirements:
   1. Demolition, removal, and disposal Work shall be in accordance with 29 CFR 1926.850 through 29 CFR 1926.860 (Subpart T - Demolition), and all other Laws and Regulations.
   2. Comply with requirements of authorities having jurisdiction.

1.3 SUBMITTALS

A. Informational Submittals: Submit the following:
   1. Procedure Submittals:
      a. Demolition and Removal Plan: Not less than ten days prior to starting demolition Work, submit acceptable plan for demolition and removal Work, including:
         1) Plan for coordinating shut-offs, capping, temporary services, and continuing utility services.
         2) Other proposed procedures as applicable.
         3) Equipment proposed for use in demolition operations.
         4) Recycling/disposal facility(ies) proposed, including facility owner, facility name, location, and processes. Include copy of appropriate permits and licenses, and compliance status.
         5) Planned demolition operating sequences.
         6) Detailed schedule of demolition Work in accordance with the accepted Process Schedule.
   2. Notification of Intended Demolition Start: Submit in accordance with Paragraph 3.1.A of this Section.
   3. Qualifications Statements:
      a. Name and qualifications of entity performing electrical removals, including copy of licenses required by authorities having jurisdiction.
      b. Name and qualifications of entity performing plumbing removals, including copy of licenses required by authorities having jurisdiction.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 PREPARATION

A. Notification:
   1. At least 48 hours prior to commencing demolition or removal, notify ENGINEER in writing of planned start of demolition Work. Do not start removals without permission of ENGINEER.

B. Protection of Surrounding Areas and Facilities:
   1. Perform demolition and removal Work in manner that prevents damage and injury to property, structures, occupants, the public, and facilities. Do not interfere with use of, and free and safe access to and from, structures and properties.
   2. Closing or obstructing of roads, drives, sidewalks, and passageways adjacent to the Work is not allowed unless indicated otherwise in the Contract Documents. Conduct the Work with minimum interference to vehicular and pedestrian traffic.
   3. Provide temporary barriers, lighting, sidewalk sheds, and other necessary protection.
   4. Repair damage to facilities that are to remain.

C. Existing Utilities: In addition to requirements of the General Conditions, Supplementary Conditions, and Division 01 Specifications, do the following:
   1. Should uncharted or incorrectly charted Underground Facilities be encountered, CONTRACTOR responsibilities shall be in accordance with the General Conditions as may be modified by the Supplementary Conditions. Cooperate with utility owners in keeping adjacent services and facilities in operation.
   2. Sanitary Sewer: Before proceeding with demolition, locate and cap all sewer lines and service laterals discharging from the building or structure being demolished.
   3. Storm Water: Existing storm water system shall remain in place until demolitions of existing building or structure is completed. Upon completing demolition, cut and cap storm sewer laterals at locations shown on the Drawings. Remove existing storm water piping and related structures between points of cutting, and backfill, restore to grade, and stabilize the area over the removed facilities.
   4. Water Piping: Before proceeding with demolition, locate and cap all potable and non-potable waterlines and service laterals serving the building or structure being demolished.
   5. Other Utilities: Before proceeding with demolition, locate and cap as required all other utilities, such as fuel and gas; heating, ventilating, and air conditioning; electric; and communications; and service laterals serving the building or structure being demolished.
   6. Shutdown of utility services shall be coordinated by CONTRACTOR, assisted by CITY as required relative to contacting utility owners.

3.2 DEMOLITION – GENERAL

A. Locate construction equipment used for demolition Work and remove demolished materials and equipment to avoid imposing excessive loading on supporting and adjacent walls, floors, framing, facilities, and Underground Facilities.

B. Pollution Controls:
   1. Use water sprinkling, temporary enclosures, and other suitable methods to limit emissions of dust and dirt to lowest practical level. Comply with Section 01 57 05, Temporary Controls, and Laws and Regulations.
   2. Do not use water when water may create hazardous or objectionable conditions such as icing, flooding, or pollution.
   3. Clean adjacent structures, facilities, properties, and improvements of dust, dirt, and debris caused by demolition Work, in accordance with the General Conditions and Section 01 74 05, Cleaning.

C. Comply with Section 01 73 29, Cutting and Patching.

D. Building or Structure Demolition:
   1. Unless otherwise approved by ENGINEER, proceed with demolition from top of building or structure to the ground. Complete demolition Work above each floor or tier before disturbing supporting members of lower levels.
   2. Demolish concrete and masonry in small sections.
   3. Remove structural framing members and lower to ground using hoists, cranes, or other suitable methods. Do not throw or drop to the ground.
   4. Break up and remove foundations and slabs-on-grade unless otherwise shown or indicated as remaining in place.

E. Demolition of Site Improvements:
   1. Pavement, Sidewalks, Curbs, and Gutters: Demolition of asphalt or concrete pavement, sidewalks, curbs, and gutters, as applicable, shall terminate at cut edges. Edges shall be linear and have a vertical cut face.
   2. Fencing, Guardrails, and Bollards: Remove to the limits shown or indicated on the Drawings. Completely remove below-grade posts and concrete.
   3. Manholes, Vaults, Chambers, and Handholes: Remove to the limits shown or indicated on the Drawings.
   4. Underground Facilities Other than Manholes, Vaults, Chambers, and Handholes: Remove to the extent shown or indicated on the Drawings. Unless otherwise shown or indicated, cap ends of piping to remain in place in accordance with the "Mechanical Removals" Article in this Section.
   5. Landscaping: Comply with Section 33 11 00, Clearing and Grubbing.

F. Salvage and Ownership:
   1. Refer to Section 01 12 13, Summary of Work, for requirements on salvage, ownership, and handling of equipment and materials removed during demolition and removal Work.

2. Materials and equipment to remain CITY's property shall be carefully removed and appropriately handled by CONTRACTOR to avoid damage and invalidation of warranties in effect, and shall be cleaned and stored at the Site (or other site specified in the Contract Documents) at place designated by ENGINEER or CITY.

G. Finishing of Surfaces Exposed by Removals: Unless otherwise shown or indicated in the Contract Documents, surfaces of walls, floors, ceilings, and other areas exposed by removals, and that will remain as finished surfaces, shall be repaired and re-finished with materials that match existing adjacent surface, or as otherwise approved by ENGINEER.

3.3 STRUCTURAL REMOVALS

A. Remove structures to lines and grades shown or indicated, unless otherwise directed by ENGINEER. Where limits are not shown or indicated, limits shall be four inches outside item to be installed. Removals beyond limits shown or indicated shall be at CONTRACTOR's expense and such excess removals shall be reconstructed to satisfaction of ENGINEER without additional cost to DEPARTMENT.

B. After removing concrete and masonry walls or portions thereof, slabs, and similar construction that ties in to the Work or to existing construction, neatly repair the junction point to leave exposed only finished edges and finished surfaces.

C. Where parts of existing structures are to remain in service following demolition, remove the portions shown or indicated for removal, repair damage, and leave the building or structure in proper condition for the intended use.
   1. Remove concrete and masonry to the lines shown or indicated by sawing, drilling, chipping, and other suitable methods. Leave the resulting surfaces true and even, with sharp, straight corners that will result in neat joints with new construction and be satisfactory for the purpose intended.
   2. Do not damage reinforcing bars beyond the area of concrete and masonry removal. Do not saw-cut beyond the area to be removed.
   3. Reinforcing bars that are exposed at surfaces of removed concrete and masonry that will not be covered with new concrete or masonry shall be removed to 1.5 inches below the final surface. Repair the resulting hole, with repair mortar for concrete and grout for masonry, to be flush with the surface.
   4. Where existing reinforcing bars are shown or indicated to extend into new construction, remove existing concrete so that reinforcing bars are clean and undamaged.

D. Where equipment or material anchored to concrete or masonry are removed and anchors are not to be re-used, remove the anchors to not less than 1.5 inches beneath surface of concrete or masonry member. Repair the resulting hole, using repair mortar for concrete and grout for masonry, to be flush with the surface. Alternately,

when the anchor is stainless steel, the anchor may be cut flush with the surface of the concrete or masonry, when so approved by ENGINEER.

E. Jambs, sills and heads of windows, passageways, doors, or other openings (as applicable) cut-in to the Work or to existing construction shall be dressed with masonry, concrete, or metal to provide smooth, finished appearance.

F. Where anchoring materials, including bolts, nuts, hangers, welds, and reinforcing steel, are required to attach the Work to existing construction, provide such materials under this Section, unless specified elsewhere in the Contract Documents.

3.4 MECHANICAL REMOVALS

A. Mechanical demolition and removal Work includes dismantling and removing existing piping, ductwork, pumps, equipment, tanks, and appurtenances as shown, indicated, and required for completion of the Work. Mechanical removals include cutting and capping as required, except that cutting of existing piping and ductwork to make connections is included under Section 01 14 16, Coordination with CITY's Operations; Section 01 73 29, Cutting and Patching; and applicable Sections of Division 40, Process Integration.

B. Demolition and Removals of Piping, Ductwork, and Similar Items:
   1. Purge piping and tanks (as applicable) of chemicals or fuel (as applicable) and make safe for removal and capping. Remove to the extent shown or indicated existing process, water, waste and vent, chemical, gas, fuel, and other piping. Remove piping to the nearest solid piping support, and provide caps on ends of remaining piping. Where piping to be demolished passes through existing walls to remain, cut off and cap pipe on each side of the wall.
   2. Caps, Closures, Blind Flanges, and Plugs:
      a. Provide closure pieces, such as blind flanges and caps, where shown or required to complete the Work.
      b. Where used in this Section, the term "cap" means the appropriate type closure for the piping or ductwork being closed, including caps, blind flanges, and other closures.
      c. Caps shall be compatible with the piping or ductwork to which the cap is attached, fluid-tight and gastight, and appropriate for the fluid or gas conveyed in the pipe or duct.
      d. Unless otherwise shown or indicated, caps shall be mechanically fastened, fused, or welded to pipe or duct. Plug piping with means other than specified in this Section only when so shown or indicated in the Contract Documents or when allowed by ENGINEER.
   3. When Underground Facilities are altered or removed, properly cut and cap piping left in place, unless otherwise shown or indicated.
   4. Remove waste and vent piping, and ductwork to extent shown and cap as required. Where demolished vent piping, stacks, and ductwork passes through existing roofing, patch the roof with the same or similar materials.

Completed patch shall be watertight and comply with roofing manufacturer's recommendations.

5. Modifications to potable water piping and other plumbing and heating system work shall comply with Laws and Regulations. All portions of potable water system that have been modified or opened shall be hydrostatically tested and disinfected in accordance with the Contract Documents, and Laws and Regulations. Hydrostatically test other, normally-pressurized, plumbing piping and heating piping.

C. Equipment Demolition and Removals:

1. To the extent shown or indicated, remove existing process equipment; pumps; storage tanks; hoisting and conveying equipment; heating, ventilating, and air conditioning equipment; generators; and other equipment.
2. Where required, disassemble equipment to avoid imposing excessive loading on supporting walls, floors, framing, facilities, and Underground Facilities. Disassemble equipment as required for access through and egress from building or structure. Disassembly shall comply with Laws and Regulations. Provide required means to remove equipment from building or structure.
3. Remove control panels, operator stations, and instruments associated with equipment being removed, unless shown or indicated otherwise.
4. Remove fuel appurtenances as applicable, including fuel storage tanks. Dispose of tank contents in accordance with Laws and Regulations.
5. Remove equipment supports as applicable, anchorages, base, grout, and piping. Remove anchorage systems in accordance with the "Structural Removals" Article in this Section. Remove small-diameter piping back to header unless otherwise indicated.
6. Remove access platforms, ladders, and stairs related to equipment being removed, unless otherwise shown or indicated.

3.5 ELECTRICAL REMOVALS

A. Electrical demolition Work includes removing existing transformers, distribution switchboards, control panels, motors, starters, conduit and raceways, cabling, poles and overhead cabling, panelboards, lighting fixtures, switches, and miscellaneous electrical equipment, as shown, specified, or required.

B. Remove existing electrical equipment and fixtures to avoid damaging systems to remain, to keep existing systems in operation, and to maintain integrity of grounding systems.

C. Remove or modify motor control centers and switchgear as shown or indicated. Modified openings shall be cut square and dressed smooth to dimensions required for installation of equipment.

D. Disconnect and remove motors, control panels, and other electrical gear where shown or indicated. Motors, microprocessors and electronics, other electrical gear

to be reused shall be stored in accordance with Section 01 66 00, Product Storage and Handling Requirements.

E. Cables in conduits to be removed shall be removed back to the power source or control panel, unless otherwise shown or indicated. Verify the function of each cable before disconnecting and removing.

F. Conduits, raceways, and cabling shall be removed where shown or indicated. Abandoned conduits concealed in floor, ceiling slabs, or in walls shall be cut flush with the slab or wall (as applicable) at point of entrance, suitably capped, and the area repaired in a flush, smooth manner acceptable to ENGINEER. Exposed conduits, junction boxes, other electrical appurtenances, and their supports shall be disassembled and removed. Repair all areas of the Work to prevent rusting on exposed surfaces.

G. Conduits in Underground Facilities not scheduled for reuse shall be suitably capped watertight where each enters building or structure to remain.

H. Where shown or indicated, remove direct burial cable. Openings in buildings for entrance of direct burial cable shall be patched with repair mortar or other material approved by ENGINEER for this purpose, and made watertight.

I. Existing poles and overhead cables shall be removed or abandoned as shown and specified. Existing substation(s) and poles owned by electric utility will be removed by the electric utility. Completely remove from the Site poles not owned by electric utility and shown or indicated for removal. Make necessary arrangements with electric utility for removal of utility company's transformers and metering equipment after new electrical system has been installed and energized.

J. Lighting fixtures, wall switches, receptacles, starters, and other miscellaneous electrical equipment, not designated as remaining as CITY's property, shall be removed and properly disposed off-Site as required.

3.6 DISPOSAL OF DEMOLITION DEBRIS

A. Remove from the Site all debris, waste, rubbish, and material resulting from demolition operations and equipment used in demolition Work. Comply with the General Conditions, Supplementary Conditions, and Section 01 74 05, Cleaning.

B. Transportation and Disposal:
   1. Non-hazardous Material: Properly transport and dispose of non-hazardous demolition debris at appropriate landfill or other suitable location, in accordance with Laws and Regulations. Non-hazardous material does not contain Asbestos, PCBs, Petroleum, Hazardous Waste, Radioactive Material, or other material designated as hazardous in Laws and Regulations.

2. Hazardous Material: When handling and disposal of hazardous materials is included in the Work, properly transport and dispose of hazardous materials in accordance with the Contract Documents and Laws and Regulations.

C. Submit to ENGINEER information required in this Section on proposed facility(ies) where demolition material will be recycled. Upon request, ENGINEER or DEPARTMENT shall be allowed to visit recycling facility(ies) to verify adequacy and compliance status. During such visits, recycling facility operator shall cooperate and assist ENGINEER and DEPARTMENT.

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SECTION 03 11 00

CONCRETE FORMING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install concrete forming. The Work also includes:
      a. Designing forming systems in accordance with requirements of ACI 347 and the Contract Documents.
      b. Providing forming to accommodate the Work under this and other Sections and building into forming items such as sleeves, anchorage devices, inserts, pipe embedments, reinforcing, and all other items to be embedded in concrete for which placement is not specifically provided under other Sections.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items that must be installed with or before concrete forming Work.
   2. Coordinate forming Specifications with requirements for finished surfaces specified in Section 03 30 00, Cast-In-Place Concrete.

C. Related Sections:
   1. Section 03 15 00, Concrete Accessories.
   2. Section 03 30 00, Cast-In-Place Concrete.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ACI 117, Specifications for Tolerances for Concrete Construction and Materials and Commentary.
   2. ACI 301, Specifications for Structural Concrete.
   3. ACI 347, Guide to Formwork for Concrete.
   4. ASTM C805/C805M, Test Method for Rebound Number of Hardened Concrete.
   5. ASTM C1074, Practice for Estimating Concrete Strength by the Maturity Method.
   6. NIST PS 1, Structural Plywood.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Professional ENGINEER:
      a. CONTRACTOR or formwork Supplier shall retain a registered professional engineer legally qualified to practice in same state as the Site. Professional engineer shall have at least five years' experience designing formwork and falsework of the type required.
      b. Responsibilities include:
         1) Reviewing formwork and falsework performance and design criteria stated in the Contract Documents.
         2) Preparing written requests for clarifications or interpretations of performance or design criteria for submittal to ENGINEER by CONTRACTOR.
         3) Preparing or supervising preparation of design calculations verifying compliance of formwork and falsework with requirements of the Contract Documents.
         4) Signing and sealing all calculations.
         5) Certifying that:
            a) Design of formwork and falsework was performed in accordance with performance and design criteria stated in the Contract Documents, and
            b) Design conforms to all Laws and Regulations, and to prevailing standards of practice.
            c) In place falsework, prior to concrete placement, complies with the intent of the forming design and complies with the Contract Documents.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Samples:
      a. Plywood form material used for smooth form finish, four inches square minimum.
      b. Form liner section sufficiently large to show two full repeating patterns, at least 12 inches square.
      c. Controlled permeability forming liner material, eight inches square, minimum.
      d. Form Liner Sample Panel:
         1) Sample shall show texture and surface pattern, required backing, form tie treatment, and treatment at liner panel joints. Use form material to be used in the Work.
         2) Minimum Size: Three feet by four feet.

B. Informational Submittals: Submit the following:
   1. Shop Drawings: When requested by ENGINEER, submit Shop Drawings showing and indicating general construction of individual forms, including:
      a. Jointing.
      b. Special formed joints or reveals.
      c. Location, pattern, and details of form tie placement, removal, and repair procedures.
      d. Location and details for temporary openings.
      e. Other items that would visually affect the finished concrete.
   2. Design of Temporary Measures: Design of formwork and falsework is CONTRACTOR's responsibility. Submit the following:
      a. Falsework layout drawings with the seal and signature of CONTRACTOR's or Supplier's professional engineer. Layout drawings shall show bracing details, waler arrangements, location of shores, joint forming details, and details at connections to previously placed concrete. ENGINEER's review will be for general conformance to the requirements of the Contract Documents and ACI 347, as indicated for delegated design in the General Conditions.
      b. Design calculations for formwork and falsework, when requested by ENGINEER.
      c. Certification letter from CONTRACTOR's or Supplier's professional engineer stating that in-place falsework was inspected and complies with the intent of the falsework design.
   3. Product Data: Manufacturer's data for proprietary materials, including form coatings, manufactured form systems, ties and accessories.
   4. Manufacturer's Instructions: Installation instructions for proprietary materials, including form coatings, manufactured form systems, ties and accessories.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery and Storage:
   1. Upon delivery to the Site, place materials in area protected from weather.
   2. Store materials in accordance with manufacturer's recommendations.
   3. Store materials above ground on framework or blocking. Cover wood for forms and other accessory materials with protective, waterproof covering. Provide for adequate air circulation or ventilation under cover.

B. Handle materials in accordance with the manufacturers' recommendations. Do not damage materials during handling.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Design Criteria:
   1. Design, erect, support, brace and maintain forming in accordance with ACI 347 so that forming safely supports vertical and lateral loads that might be applied, until such loads can be supported by the concrete structure. Carry vertical and lateral loads to ground by forming system or in-place construction that has attained adequate strength for the purpose. Construct forming so that concrete members and structures are of correct size, shape, alignment, elevation, and position.
   2. Design forms and falsework to include values of live load, dead load, weight of moving equipment operated on forming, concrete mix, height of concrete drop, vibrator frequency, ambient temperature, foundation pressures, stresses, lateral stability, and other factors pertinent to safety of structure during construction.
   3. Provide shores and struts with positive means of adjustment capable of taking up forming settlement during concrete placing operations, using wedges or jacks, or a combination thereof. Provide trussed supports when adequate foundations for shores and struts cannot be secured.
   4. Support form facing materials by structural members spaced sufficiently close to prevent beyond tolerance deflection, in accordance with ACI 117. Fit forms placed in successive units for continuous surfaces to accurate alignment, free from irregularities and within allowable tolerances. For long-span members without intermediate supports, provide camber in forming as required for anticipated deflections resulting from weight and pressure of fresh concrete and construction loads.
   5. Design and construct forming to be readily removable without impact, shock or damage to concrete surfaces and adjacent materials.
   6. Provide forming sufficiently tight to prevent leakage of cement paste during concrete placing. Solidly butt joints and provide backup material at joints as required to prevent leakage and fins.

2.2 FORM MATERIALS

A. Forms for Smooth Finish Concrete:
   1. Unless otherwise shown or indicated in the Contract Documents, construct forming for smooth concrete surfaces with plywood, metal, metal-framed plywood-faced, or other panel type materials acceptable to ENGINEER, to provide continuous, straight, smooth as-cast surfaces with no wood grain or other surface texture imparted by forming. Provide in largest practical sizes to minimize number of joints and to conform to joint system shown or specified in the Contract Documents. Provide form material with sufficient thickness to withstand pressure of newly placed concrete without bow or deflection.

B. Forms for Standard Finish Concrete:
   1. Form concrete surfaces designated to have standard formed finish with plywood, lumber, metal, or other acceptable material. Provide lumber that is dressed on at least two edges and one side.

C. Forms for Architecturally Finished Concrete:
   1. Form finish concrete surfaces with units of face design, size, arrangement, and configuration as shown or as required to comply with approved Project job mock-up. Provide solid backing and form supports to ensure stability of form liners.
   2. Form Material: Overlaid plywood in accordance with NIST PS 1. Provide B-B high density overlaid concrete form, Class I.
   3. Form Liners: Rigid PVC or fiberglass in pattern shown or indicated.
   4. Form Reuse: To be determined by ENGINEER at time of installation.
   5. Rustication Joints: Rigid PVC in profile shown or indicated.
   6. Panel Joints: Conceal joints behind rustication joints, unless approved by ENGINEER in writing.

E. Form Ties:
   1. Provide factory-fabricated metal form ties, designed to prevent form deflection, and to prevent spalling of concrete surfaces upon removal.
   2. Unless otherwise shown or indicated in the Contract Documents, provide ties so that portion of tie remaining within concrete after removal of exterior parts of tie is at least 1.5 inches from the outer concrete surface. Unless otherwise shown or indicated in the Contract Documents, provide form ties that will leave a hole no larger than one-inch diameter in concrete surface.
   3. Ties shall have waterstops on all exterior, below-grade walls, and walls subject to hydrostatic pressure.
   4. Ties shall leave a uniform, circular hole when forms are removed.
   5. Do not use removable ties unless accepted by ENGINEER. Removable ties are not allowed on exterior below-grade walls or walls subject to hydrostatic pressure. If removable ties are accepted, CONTRACTOR shall submit hole repair details for ENGINEER approval.
   6. Wire ties are not allowed.
   7. Do not use reinforcing bars shown by the Drawings as part of the form tie system unless approved by ENGINEER.

F. Form Coatings:
   1. Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatment of concrete surfaces requiring bond or adhesion, nor impede wetting of surfaces to be cured with water or curing compounds. For concrete surfaces that will be in contact with potable water or water that will be treated to become potable, form coating shall be a mineral oil base coating.

G. Controlled Permeability Formwork (CPF) Liner:
   1. Provide surface densification for wall surfaces, where shown or indicated in the Contract Documents, through use of CPF liner material that wicks water and trapped air away from the form surface.
   2. Product and Manufacturer: Provide one of the following CPF liner systems:
      a. Zemdrain MD manufactured by DuPont
      b. Or equal.
   3. CPF liner shall consist of a filter layer constructed of 100% polypropylene fibers, thermally bonded, which is laminated to a plastic net that ensures drainage and provides stiffness to the liner. Material shall have the following properties:
      a. Non-compressible under concrete pressure.
      b. Controlled pore size to permit drainage of excess water and air while retaining cement particles, mean pore size less than 35 microns.
      c. Retains within its structure minimum of 0.5 liters of water per square meter of material.
      d. Liner shall not leave filaments on the concrete surface.
   4. CPF liner shall improve characteristics performance of concrete as follows:
      a. Surface Hardness: In tests performed in accordance with ASTM C805/C805M, mean rebound number calculated for CPF liner face shall exceed that of control face (cast using standard formwork without CPF liner and same concrete mix and placement procedures) by minimum of five rebound units.
      b. Surface shall have uniform texture and be free of minor surface defects due to trapped air.
   5. Staples used for fastening the liner shall be stainless steel.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine substrate and conditions under which the Work will be performed and notify ENGINEER in writing of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 FORM CONSTRUCTION

A. Construct forms in accordance with ACI 347; to the exact sizes, shapes, lines, and dimensions shown; as required to obtain accurate alignment, location, and grades; to tolerances specified; and to obtain level and plumb work in finish structures. Provide for openings, offsets, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required. Use selected materials to obtain required finishes. Finish shall be in accordance with approved mock-up or sample panel, when specified.

B. Allowable Tolerances:
   1. Construct forming to provide completed concrete surfaces complying with tolerances specified in ACI 117, ACI 301, and ACI 347.
      a. Architectural finish forming, and where shown or indicated on the Drawings, shall be Class A surface, 1/8-inch offset.
      b. Other surfaces exposed to view shall be Class B surface, 1/4-inch offset.
      c. Other surfaces shall be Class C surface, 1/2-inch offset.
   2. Tolerances apply to form offsets and to irregularities within the formed surface when measured with a straightedge over a five-foot distance.

C. Install forming and accessories for facilities in accordance with manufacturer's instructions, Laws and Regulations, and the Contract Documents.

D. Fabricate forms for easy removal without damaging concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where the slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and assure ease of removal.

E. Provide temporary openings where interior area of forming is inaccessible for cleanout, for inspection before concrete placement, and for placing concrete. Brace temporary closures and set tightly to forms to prevent loss of cement paste. Locate temporary openings on forms in locations as inconspicuous as possible, consistent with requirements of the Work. Form intersecting planes of openings to provide true, clean-cut corners, with edge grain of plywood not exposed as form for concrete.

F. Falsework:
   1. Erect falsework and support, brace, and maintain falsework to safely support vertical, lateral, and asymmetrical loads applied until such loads can be supported by in-place concrete structures. Construct falsework so that adjustments can be made for take-up and settlement.
   2. Provide wedges, jacks or camber strips to facilitate vertical adjustments. Carefully inspect falsework and formwork during and after concrete placement operations to determine abnormal deflection or signs of failure; make necessary adjustments to produce finished Work of required dimensions.

G. Forms for Smooth Finish Concrete:
   1. Do not use metal cover plates for patching holes or defects in forms.
   2. Provide sharp, clean corners at intersecting planes, without visible edges or offsets. Back joints with extra studs or girts to maintain true, square intersections.
   3. Use extra studs, walers, and bracing to prevent bowing of forms between studs and to avoid bowed appearance in concrete. Do not use narrow strips of form material that will produce bow.

4. Assemble forms so they may be readily removed without damage to exposed concrete surfaces.
5. Form molding shapes, recesses, rustication joints and projections with smooth-finish materials, and install in forms with sealed joints to prevent displacement.

H. Corner Treatment:
1. Form exposed corners of beams, walls, foundations, bases and columns to produce smooth, solid, unbroken lines, except as otherwise shown or indicated in the Contract Documents. Chamfer exposed corners.
2. Form chamfers with 3/4-inch by 3/4-inch strips, unless otherwise shown or indicated in the Contract Documents, accurately formed and surfaced to produce uniformly straight lines and tight edge joints. Use rigid PVC chamfers for architecturally formed concrete. Extend terminal edges to required limit and miter chamfer strips at changes in direction.
3. Reentrant or internal and unexposed corners may be formed either square or chamfered.

I. Joints:
1. For joint treatment, comply with Section 03 15 00, Concrete Accessories. Locate joints as shown and specified.

J. Openings and Built-In Work:
1. Provide openings in concrete forming shown or required under other Sections. Refer to Paragraph 1.1.B of this Section for coordination requirements.
2. Accurately place and securely support items to be built into forms.

K. Sealing Forming:
1. Forming joints shall be tight-fitting or otherwise sealed to prevent loss of cement paste.
2. Provide forming resting against concrete surfaces with compressible gasket material between the concrete and edge of form, to fill irregularities and create tight seal.

L. Cleaning and Tightening:
1. Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before concrete is placed. Retighten forms immediately after placing concrete, as required to eliminate cement paste leaks.

M. Tie Hole Repair:
1. Repair tie holes in accordance with Section 03 30 00, Cast-In-Place Concrete.

3.3 FORM COATINGS

A. Coat form contact surfaces with non-staining form-coating compound before installing reinforcing materials. Do not allow excess form coating material to accumulate in forms or come into contact with surfaces that will be bonded to fresh concrete. Apply in compliance with manufacturer's instructions.

B. Coat steel forms with non-staining, rust-preventative form oil, or otherwise protect against rusting. Do not use rust-stained steel forming.

C. Do not use form coatings on form surfaces covered with CPF liner material.

3.4 INSTALLATION OF EMBEDDED ITEMS

A. Set and build into forming anchorage devices and other embedded items, shown, specified, or required under other Sections. Refer to Paragraph 1.1.B of this Section for coordination requirements. Use necessary setting drawings, diagrams, instructions, and directions.

B. Edge Forms and Screeds Strips for Slabs:
   1. Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units to support screeds.

3.5 CONTROLLED PERMEABILITY FORMING LINER

A. Where shown or indicated in the Contract Documents, install controlled permeability forming (CPF) liner material in accordance with manufacturer's instructions so that liner entirely and continuously covers forming surface.

B. Do not use form release agent on forms with CPF liner. Remove residual traces of release agent on previously used forms prior to placing liner.

C. Joints and seams in CPF liner shall be taped with materials recommended by liner manufacturer. Attach CPF liner to form surface at intermediate spacing to prevent buckles and ripples in liner material when warmed by fresh concrete placement. Spacing of attachments shall not exceed two feet.

D. Form panel edges, except the bottom, shall be taped around corner with materials recommended by liner manufacturer. Edges of penetrations through form, including form tie holes, shall be taped or otherwise sealed. Leave open the liner at bottom edge of forms to facilitate drainage.

E. CPF liner can be reused one time without removing liner from forms. Prior to reuse, wash the liner material and remove all concrete and other foreign material.

3.6 FIELD QUALITY CONTROL

A. Tests and Inspections:
   1. Before placing concrete, check ties, tie cones, tie waterstops, embedded items, form coatings, forming stability, alignment, and tolerances. Make corrections and adjustments to ensure forming complies with intent of the forming design, proper stability of forming systems, and accurate size and location of concrete members.
   2. During concrete placing, check forming and related supports to ensure that forms are not displaced and that completed Work will be within specified tolerances.
   3. If forms are unsatisfactory in any way, either before or during concrete placing, stop or postpone placing of concrete until defects are corrected as required by CONTRACTOR's or Supplier's professional engineer and accepted by ENGINEER.

3.7 REMOVAL OF FORMS

A. Determination of time between placing concrete and removing forms is CONTRACTOR's responsibility. Requirements specified in this Section are minimum times and requirements intended to ensure that concrete will support its own weight, and do not consider additional effects of the construction. Additional effects of the construction shall be accounted for by CONTRACTOR when determining time for removing forming. Time for removing of forms is subject to ENGINEER's acceptance.

B. Comply with requirements of ACI 301 and ACI 347, except as indicated in the Contract Documents.

C. Removal of Forms for Walls, Columns, Sides of Beams and Girders, and Slab and Foundation Edges:
   1. Comply with requirements of Table 03 10 00-A of this Section:

TABLE 03 10 00-A, REMOVAL OF FORMS

	Average Daily Ambient Air Temperature (deg F)				**Min. Concrete Compressive Strength for Form Removal**
Component	**Over 70 F**	**60 F to 70 F**	**50 F to 60 F**	**Below 50 F**	
Walls	One day	Two days	Three days	See Para-graph 3.8.C.2 of this Section	750 psi
Columns	Two days	Three days	Four days		1000 psi
Side of beams and girders	One day	One day	Two days		500 psi
Slab and foundation edges	One day	One day	Two days		500 psi

2. When average daily ambient air temperature is below 50 degrees F, do not remove forms until concrete attains minimum compressive strength indicated in Table 03 10 00-A for form removal, and comply with Paragraph 3.8.C.3.b of this Section.
3. Concrete Strength Requirements for Form Removal:
   a. For other than beams and elevated slabs, do not remove forms until concrete attains minimum concrete compressive strength indicated in Table 03 10 00-A for form removal.
   b. For beams and elevated slabs, do not remove supporting forms or shoring until concrete attains minimum of 90 percent of its specified compressive strength.

D. Alternative Criteria for Removing Forms for Walls, Columns, Sides of Beams and Girders, and Slab and Foundation Edges: CONTRACTOR has the option of submitting an alternative removal of forms table, together with supporting data, for ENGINEER's acceptance. Supporting data shall include representative field data for each different placement ambient temperature condition and minimum of three tests per temperature condition to ensure that accurate correlation between concrete strength and placement temperature is obtained.

E. Determination of In-place Concrete Strength:
   1. Determine compressive strength of in-place concrete by compression test specimens cured at the Site under the same conditions of temperature and moisture as the concrete member under consideration.
   2. Alternately, determine compressive strength of in-place concrete by maturity factor procedure in accordance with ASTM C1074 and approved by ENGINEER. Location of embedded thermistors or thermocouples shall be as approved by ENGINEER.

F. When high-early strength concrete is used, time for removing the forms will be developed at the Site from the age/strength relationships established for the materials and proportions used by tests in accordance with ACI 301.

G. Leave form facing material in place for minimum of four days after concrete placement, unless otherwise approved by ENGINEER.

H. Continue curing, including bottom surfaces of slabs and beams, after form removal in accordance with Section 03 30 00, Cast-In-Place Concrete.

3.8 PERMANENT SHORES

A. Provide permanent shores in accordance with ACI 347.

B. Reshores are not allowed.

3.9 RE-USE OF FORMS

A. Clean and repair surfaces of forms to be re-used in the construction. Do not use split, frayed, delaminated, or otherwise damaged form facing material. Apply form coating compound material to concrete contact surfaces as specified for forming.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close all joints. Align and secure joints to avoid offsets. Do not use "patched" forms for exposed concrete surfaces. Form surfaces are subject to ENGINEER's approval.

+ + END OF SECTION + +

SECTION 03 15 00

CONCRETE ACCESSORIES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install concrete accessories.

B. Related Sections:
   1. Section 03 11 00, Concrete Forming.
   2. Section 03 60 00, Grouting.
   3. Section 07 92 00, Joint Sealants.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ACI 301, Standard Specifications for Structural Concrete.
   2. ASTM D1752, Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
   3. CRD-C572, U.S. Army Corps of Engineers Specifications for Polyvinyl-Chloride Waterstop.

1.3 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Layout of construction and expansion joint locations. Submit and obtain approval prior to submitting concrete reinforcement Shop Drawings.
      b. For construction and expansion joints that require waterstops, submit layout of locations showing waterstop details. Indicate waterstop type, waterstop joint conditions, and details on how joint conditions will be handled.
      c. Layout of all control joint locations.

B. Informational Submittals: Submit the following:
   1. Manufacturer's Instructions: Manufacturer's specifications and installation instructions for all materials required.

1.4 DELIVERY, STORAGE AND HANDLING

A. Transportation and Handling of Products:
   1. Deliver materials to Site to ensure uninterrupted progress of the Work.
   2. Comply with Section 01 65 00, Product Delivery Requirements.

B. Storage and Protection:
   1. Store concrete joint materials on platforms or in enclosures or covered to prevent contact with ground and exposure to weather and direct sunlight. Comply with manufacturer's storage and protection requirements.
   2. Comply with Section 01 66 00, Product Storage and Handling Requirements.

PART 2 – PRODUCTS

2.1 WATERSTOPS

A. Polyvinyl Chloride (PVC):
   1. Material Requirements:
      a. Waterstops shall be extruded from elastomeric PVC compound containing plasticizers, resins, stabilizers, and other materials necessary to meet requirements of the Contract Documents and requirements of CRD-C572. Do not use reclaimed or scrap material.
      b. Tensile strength of finished waterstop: 1,400 psi, minimum.
      c. Ultimate elongation of finished waterstop: 280 percent, minimum.
      d. Minimum thickness shall be 3/8-inch over entire width of waterstop.
      e. Provide waterstops with minimum of seven ribs equally spaced at each end on each side. First rib shall be at the edge. Ribs shall be a minimum of 1/8-inch in height.
      f. Provide waterstops with hog rings or factory-installed grommets anchored to exterior ribs to facilitate tying waterstop in position.
   2. Split waterstops are not allowed.
   3. Construction Joints: Waterstops shall be flatstrip ribbed type, six-inch minimum width, unless otherwise shown or indicated in the Contract Documents.
   4. Expansion Joints: Waterstops shall be centerbulb ribbed type, nine-inch minimum width, unless otherwise shown or indicated in the Contract Documents. Centerbulb shall have minimum outside diameter of 7/8-inch.
   5. Product and Manufacturer: Provide one of the following:
      a. W.R. Meadows, Inc.
      b. Durajoint Concrete Accessories.
      c. Greenstreak Plastic Products Company.
      d. Paul Murphy Plastics Company.
      e. Vinylex Corporation.
      f. Or equal.

B. Hypalon:
   1. Provide hypalon waterstops as shown or indicated in the Contract Documents, 40-mils thick.
   2. Waterstop shall be an integral part of manufacturer's joint sealing system and shall be in accordance with manufacturer's published recommendations.
   3. Product and Manufacturer: Provide one of the following:
      a. Sikadur Combiflex, as manufactured by Sika Corporation.
      b. Or equal.

C. Hydrophilic Waterstop Materials:
   1. General Material Properties:
      a. Bentonite-free, and expandable by minimum of 80 percent of dry volume in presence of water to form watertight joint seal without damaging concrete in which material is cast. Provide only where shown or indicated in the Contract Documents.
      b. Material shall be composed of resins and polymers that absorb water and cause an increase in volume in completely reversible and repeatable process. Waterstop material shall be dimensionally stable after repeated wet-dry cycles with no deterioration of swelling potential.
      c. Select materials that are recommended by manufacturer for type of liquid to be contained.
   2. Hydrophilic Rubber Waterstop:
      a. Minimum cross sectional dimensions shall be 3/16-inch by 3/4-inch.
      b. Product and Manufacturer: Provide one of the following:
         1) Duroseal Gasket, by BBZ USA, Inc.
         2) Adeka Ultraseal MC-2010M, by Asahi Denka Kogyo K.K.
         3) Hydrotite, by Greenstreak Plastic Products Company.
         4) Or equal.
   3. Hydrophilic Sealant:
      a. Hydrophilic sealant shall adhere firmly to concrete, metal, and PVC in dry or damp condition. When cured sealant shall be elastic indefinitely.
      b. Product and Manufacturer: Provide one of the following:
         1) Duroseal Paste, by BBZ USA, Inc.
         2) Adeka Ultraseal P-201, by Asahi Denka Kogyo K.K.
         3) Hydrotite, by Greenstreak Plastic Products Company.
         4) SikaSwell S, by Sika Corporation.
         5) Or equal.

D Injection Hose Waterstop System:
   1. Injection Hose Waterstop:
      a. Injection hose shall consist of PVC or neoprene central core of sufficient strength to resist weight of minimum of 25 vertical feet of fresh concrete placed upon it. Provide injection openings closely spaced in minimum of three locations equally spaced around perimeter of hose. Seal openings with strips of closed cell foam of consistency to act as one-way valves preventing entrance of cement paste while allowing free flow of injection material, pumped through hose, into the concrete joint surface.

b. Injection hose system shall be appropriate for injection of hydrophilic injection resin. Hose shall allow for vacuuming operations and repeated use. Construction of hose shall permit free discharge of specified injected grout into concrete without backwash, for entire length of hose.

c. Injection hose system shall be complete with hold-down clips, connection tubes, fittings, and injection connections designed to be mounted flush with concrete surface and sealed to allow future injections. All system components shall be provided by same manufacturer.

d. Product and Manufacturer: Provide one of the following:
   1) Fuko Injection System, by BBZ USA, Inc.
   2) SikaSwell Hose, by Sika Corporation.
   3) Or equal.

2. Hydrophilic Injection Resin:

a. Hydrophilic injection resin shall be acrylate-ester based. Viscosity shall be less than 50 centipoises (cps). Resin shall be water soluble in its uncured state, solvent-free, and non-water reactive. In cured state, resin shall form solid, hydrophilic, flexible material resistant to permanent water pressure, and shall not attack bitumen, joint sealants, and concrete.

b. Product and Manufacturer: Provide one of the following:
   1) Duroseal Inject 1K/2K, by BBZ USA, Inc.
   2) Sika Injection 29, by Sika Corporation.
   3) Or equal.

2.2 PREFORMED EXPANSION JOINT FILLER

A. Provide preformed expansion joint filler complying with ASTM D1752, Type I (sponge rubber) or Type II (cork).

2.3 CONCRETE CONSTRUCTION JOINT ROUGHENER

A. Provide water-soluble non-flammable, surface-retardant roughener.

B. Product and Manufacturer: Provide one of the following for the types of joints specified:
   1. Rugasol-S, by Sika Corporation for horizontal joints only.
   2. Concrete Surface Retarder-Formula S, by Euclid Chemical Company, for horizontal joints only.
   3. Concrete Surface Retarder-Formula F, by Euclid Chemical Company, for vertical joints only.
   4. TK-6100 Concrete Form Surface Retarder, by TK Products.
   5. Or equal.

2.4 EPOXY BONDING AGENT

A. Provide a two-component epoxy-resin bonding agent.

B. Product and Manufacturer: Provide one of the following:
   1. Sikadur 32 Hi-Mod LPL, by Sika Corporation.
   2. Eucopoxy LPL, by the Euclid Chemical Company.
   3. Resi-Bond J-58, by Dayton Superior.
   4. Or equal.

2.5 EPOXY-CEMENT BONDING AGENT

A. Provide three component epoxy resin-cement blended formulated as bonding agent.

B. Product and Manufacturer: Provide one of the following:
   1. Sika Armatec 110 EpoCem, as manufactured by Sika Corporation.
   2. Duralprep A.C., as manufactured by the Euclid Chemical Company.
   3. Emaco P24, as manufactured by MBT/ChemRex.
   4. Or equal.

2.6 JOINT SEALANT AND ACCESSORIES

A. For joint sealants and accessories used on isolation joints, control joints, and expansion joints, refer to Section 07 92 00, Joint Sealants.

2.7 CONCRETE BOND BREAKERS

A. Provide asphalt-saturated rag felt building paper, not less in weight than commercially known as 15 pound felt building paper, which weighs 15 pounds per 100 square feet.

B. Chemical Bond Breaker:
   1. Provide medium solids resin solution chemical concrete bond breaker complying with ASTM C309, Type I, Class B.

PART 3 – EXECUTION

3.1 INSPECTION

A. CONTRACTOR and installing Subcontractor, if any, shall examine substrate and conditions under which the Work is to be performed and notify ENGINEER in writing of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 CONSTRUCTION JOINTS

A. Comply with requirements of ACI 301 and the Contract Documents.

B. Locate and install construction joints as shown or indicated on the Drawings. Where not shown or indicated, locate joints to not impair strength of the structure; position

joints at points of minimum shear. Location of joints shall be approved by ENGINEER. In addition to joints shown or indicated on the Drawings, locate construction joints as follows:

1. In foundation mats, locate joints at spacing of approximately 40 feet. Joints shall be located within middle third of element span, unless otherwise shown or indicated on the Drawings. Element span shall be considered distance between piles or, as determined by ENGINEER, distance between bearing elements, such as columns, exterior walls and interior walls. Place concrete in strip pattern, unless otherwise shown or indicated on the Drawings.
2. In walls, locate joints at a maximum spacing of 40 feet. Locate joints away from wall intersections a minimum of one-quarter of the clear span distance between wall intersections measured horizontally.
3. In structural slabs and beams, joints shall be located within middle third of element span and shall be located in compliance with ACI 301, unless otherwise shown or indicated on the Drawings.
4. In slabs on grade, locate joints at spacing of approximately 40 feet. Place concrete in strip pattern, unless otherwise shown or indicated on the Drawings.

C. Horizontal Joints:

1. Roughen concrete at interface of construction joints by abrasive blasting, hydroblasting, or using surface retardants and water jets to expose aggregate and remove accumulated concrete on projecting rebar immediately subsequent to form stripping, unless otherwise approved by ENGINEER. Immediately before placing fresh concrete, thoroughly clean existing contact surface using stiff brush or other tools and stream of pressurized water. Surface shall be clean and wet, and free from pools of water at time of placing fresh concrete.
2. Remove laitance, waste mortar, and other substances that may prevent complete adhesion. Where joint roughening was performed more than seven days prior to concrete placing or where dirt or other bond reducing contaminants are on surface, perform additional light abrasive blasting or hydroblasting to remove laitance and all bond-reducing materials just prior to concrete placement.
3. Provide over contact surface of concrete a six-inch layer of Construction Joint Grout as specified in Section 03 60 00, Grouting. Place fresh concrete before grout has attained its initial set. Placement of grout may be omitted if concrete mix has slump increased to at least six inches by addition of high range water reducer.

D. Vertical Joints:

1. Apply roughener to the form in thin, even film by brush, spray, or roller in accordance with manufacturer's instructions. After roughener is dry, concrete may be placed.
2. When concrete has been placed, remove joint surface forms as early as necessary to allow for removal of surface retarded concrete. Forms covering member surfaces shall remain in place as required under Section 03 11 00, Concrete Forming. Wash loosened material off with high-pressure water spray to obtain roughened surface subject to approval by ENGINEER. Alternately,

surface shall be roughened by abrasive blasting or hydroblasting to expose aggregate. Outer one-inch of each side of joint face shall be masked and protected from blasting to avoid damaging member surface.

3.3 EXPANSION JOINTS

A. Comply with requirements of ACI 301 and this Section.

B. Locate and install expansion joints as shown and indicated in the Contract Documents. Install joint filler in accordance with manufacturer's instructions. Install sealants as specified in this Section.

3.4 CONTROL JOINTS

A. Provide control joints in non-water bearing slabs on grade as shown or indicated on the Drawings. Where control joints are not shown or indicated on the Drawings, space control joints at 24 to 36 times thickness of slab in both directions. Locate control joints only at places approved by ENGINEER.

B. A groove, with depth of at least 25 percent of the member thickness, shall be tooled, formed, or saw-cut in concrete. Groove shall be filled with joint sealant material in accordance with Section 07 92 00, Joint Sealants.

C. Where control joint is formed by sawcutting, make sawcut in presence of ENGINEER immediately after concrete has set sufficiently to support the saw and be cut without damage to concrete. Keep concrete continually moist during cutting. Joints shall be approximately 1/8-inch wide.

D. Control joints may be formed with tool or by inserting joint forming strip. After concrete has achieved design strength, remove upper portion of joint forming strip and fill void with sealant.

3.5 ISOLATION JOINTS

A. Provide isolation joint where sidewalk or other slab on grade abuts a concrete structure and slab on grade is not shown doweled into that structure. Form isolation joint by 1/2-inch joint filler with upper 1/2-inch of joint filled with sealant.

3.6 WATERSTOPS

A. General:
   1. Comply with ACI 301 and this Section. Make joints in accordance with manufacturer's instructions.
   2. Provide PVC waterstops, except where otherwise shown or indicated on the Drawings.

3. Provide waterstops in all joints where concrete construction is below grade or intended to retain liquid. Install waterstop to the higher of: at least 12 inches above grade, or 12 inches above overflow liquid level in tanks.
4. Waterstops shall be fully continuous for extent of joint and with waterstops in intersecting joints. Maintain waterstop continuity at transitions between waterstops in joints at different levels and orientations.
5. In vertical joints in walls that are free at the top, waterstops shall extend no closer than six inches from top of wall.
6. In placing concrete around horizontal waterstops, with waterstop flat face in horizontal plane, work the concrete under waterstops by hand to avoid forming air and rock pockets.

B. Polyvinyl Chloride Waterstop:
1. Waterstops shall be positively held from displacement during concrete placing. Tie waterstops to reinforcement or other rigid supports at maximum spacing of 18 inches so that waterstop is securely and rigidly supported in proper position during concrete placing. Continuously inspect waterstops during concrete placing to ensure proper positioning.
2. Perform splicing in waterstops by heat sealing adjacent waterstop sections in accordance with manufacturer's printed recommendations. The following is required:
   a. Material shall not be damaged by heat sealing.
   b. Splices shall have tensile strength of not less than 60 percent of unspliced material's tensile strength.
   c. Maintain the continuity of waterstop ribs and of its tubular center axis.
3. Only butt-type joints of ends of two identical waterstop sections shall be made while material is in forms.
4. Prefabricated PVC Waterstop Joint:
   a. Joints with waterstops involving more than two ends to be jointed together, and joints that involve an angle cut, alignment change, or joining of two dissimilar waterstop sections, shall be prefabricated by CONTRACTOR or manufacturer prior to placing in the forms.
   b. Prefabricated joints shall have minimum of 2.0 feet of waterstop material beyond joint in each direction.
   c. Install prefabricated joint assembly in the forms and butt-weld each two-foot end to a straight-run portion of waterstop in place in the forms.
5. Where centerbulb waterstop intersects and is jointed with non-centerbulb waterstop, seal end of centerbulb using additional PVC material as required.
6. Symmetrical halves of waterstops shall be equally divided between concrete placements at joints and centered within joint width, unless shown or indicated otherwise in the Contract Documents. Place centerbulb waterstops in expansion joints so that centerbulb is centered on joint filler material.
7. When waterstop is installed in the forms or embedded in first concrete placement and waterstop remains exposed to atmosphere for more than four days, implement suitable precautions to shade and protect exposed waterstop from direct rays of sun during entire exposure, until exposed portion of waterstop is embedded in concrete.

8. Protect waterstop placed in joints intended for future concrete placement from direct rays of the sun by temporary means until permanent cover is installed, so that waterstop is not exposed to direct rays of the sun for more than four days total.

C. Hypalon Waterstop:
1. Provide hypalon waterstop where shown or indicated on the Drawings.
2. Install in accordance with manufacturer's recommendations.

D. Hydrophilic Rubber Waterstop and Sealant:
1. Where a hydrophilic rubber waterstop or sealant is required in accordance with the Contract Documents, or where approved by ENGINEER, install waterstop or sealant in accordance with manufacturer's instructions and recommendations; except, as modified in the Contract Documents.
2. When requested by ENGINEER, provide manufacturer's technical assistance at the Site.
3. Locate waterstop or sealant as near as possible to center of joint. Waterstop or sealant shall be continuous around entire joint. Minimum distance from edge of waterstop to face of the member shall be three inches.
4. Where hydrophilic rubber waterstop is used in combination with PVC waterstop, hydrophilic rubber waterstop shall overlap PVC waterstop for minimum of six inches. Fill contact surface between hydrophilic rubber waterstop and PVC waterstop with hydrophilic sealant.
5. Where wet curing methods are used, apply hydrophilic rubber waterstop and sealant after curing water is removed and just prior to closing up of the forms for concrete placement. Protect hydrophilic rubber waterstop and sealant from direct rays of sun and from becoming wet prior to concrete placement. If material becomes wet and expands, allow material to dry until material has returned to original cross sectional dimensions before placing concrete.
6. Install hydrophilic rubber waterstop in bed of hydrophilic sealant, before skinning and curing begins, so that irregularities in concrete surface are completely filled and waterstop is bonded to sealant. After sealant has cured, install concrete nails, with washers of a diameter equal to waterstop width, to secure waterstop to concrete at maximum spacing of 1.5 feet.
7. Prior to installing hydrophilic sealant, wire brush or sandblast the concrete surface to remove laitance and other materials that may interfere with bonding. Metal and PVC surfaces to receive sealant shall be cleaned of paint and any material that may interfere with bond. When sealant alone is shown or indicated in the Contract Documents, place sealant placed in built-up bead which has a triangular cross section with each side of triangle at least 3/4-inch long, unless otherwise indicated in the Contract Documents. Do not place concrete until sealant has cured as recommended by sealant manufacturer.

E. Injection Hose Waterstop:
1. Provide injection hose waterstop where shown or indicated on the Drawings.
2. Install injection hose in maximum lengths recommended by manufacturer, but not greater than 40 feet.

3. Clean concrete surface of all debris prior to installing injection hose. Install injection hose on two-inch wide strip of unroughened concrete at center of member width in direct contact with concrete. Clamp hose into position with anchor clips set into concrete spaced no more than 10 inches on centers.
4. Where injection hose is used in combination with PVC waterstop, hose shall overlap PVC waterstop for minimum of six inches and shall be less than two inches away from PVC waterstop.
5. Provide each end of injection hose with solid injector hoses mounted to formwork using a fitting. Provide fitting with cover that seals hose from cement paste and serves as a removable and reinstallable cover for future reinjections. Mount fittings on dry side of member, unless shown otherwise on the Drawings.
6. Hose system shall not be injected until authorization is given by ENGINEER. When authorized, hose system shall be injected with hydrophilic resin in conformance with manufacturer's recommendations. Injection shall be by an applicator authorized by injection system manufacturer.
7. Injection system Supplier shall provide necessary supervision to satisfy ENGINEER that application conforms strictly to manufacturer's recommendations.
8. Prior to resin injection, flush hose system with water. At end of injection operation, clean the hose system in accordance with manufacturer's recommendations to facilitate future injections. Plug and cover injection and vent ends of system, leaving system ready for future reinjections.

3.7 BONDING AGENT

A. Use epoxy bonding agent for bonding of fresh concrete to concrete that has been in place for at least 60 days, and for bonding to existing concrete.

B. Use epoxy-cement bonding agent for the following:
   1. Bonding toppings and concrete fill to concrete that has been in place for at least 60 days, and for bonding to existing concrete.
   2. For locations where bonding agent is required and concrete cannot be placed within open time period of epoxy bonding agent.

C. Use cement-water slurry as bonding agent for toppings and concrete fill to new concrete. Cement water slurry shall be worked into surface with stiff bristle broom and place the concrete before cement-water slurry dries.

D. Handle and store bonding agent in accordance with manufacturer's printed instructions and safety precautions.

E. Mix bonding agent in accordance with manufacturer's instructions.

F. Before placing fresh concrete, thoroughly roughen and clean hardened concrete surfaces and coat with bonding agent not less than 1/16-inch thick. Place fresh

concrete while bonding agent is still tacky (within its open time), without removing in-place bonding agent coat, and as directed by manufacturer.

3.8 BEARING PAD INSTALLATION

A. Neoprene Bearing Pad: Install with water insensitive adhesive in accordance with manufacturer's instructions.

+ + END OF SECTION + +

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SECTION 03 20 00

CONCRETE REINFORCING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install concrete reinforcing.
   2. Extent of concrete reinforcing is shown and indicated in the Contract Documents.
   3. Work includes fabrication and placement of reinforcing including bars, ties, and supports, and welded wire fabric for concrete, encasements, and fireproofing.

B. Related Sections:
   1. Section 03 15 00, Concrete Accessories.
   2. Section 05 05 33, Anchor Systems.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ACI 315, Details and Detailing of Concrete Reinforcement.
   2. ACI 318, Building Code Requirements for Structural Concrete.
   3. ACI 350, Code Requirements for Environmental Engineering Concrete Structures.
   4. ANSI/AWS D1.4, Structural Welding Code - Reinforcing Steel.
   5. ASTM A82, Specification for Steel Wire, Plain, for Concrete Reinforcement.
   6. ASTM A185, Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
   7. ASTM A615, Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
   8. ASTM A706, Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
   9. ASTM A767, Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
   10. ASTM A775, Specification for Epoxy-Coated Steel Reinforcing Bars.
   11. ASTM E329, Specification for Agencies Engaged in Construction Inspection and/or Testing.
   12. Concrete Reinforcing Steel Institute (CRSI), CRSI 1MSP, Manual of Standard Practice.
   13. ICC Evaluation Service (ES) AC 308, Acceptance Criteria for Post-Installed Anchors in Concrete Elements.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Testing Laboratory: Shall meet requirements of ASTM E329 and shall have experience in the testing welded splices of reinforcing steel and tension testing of reinforcing bars set in adhesive in hardened concrete.
   2. Installer of Adhesive Dowels: Shall be experienced and certified by manufacturer of adhesive as possessing necessary training for installing manufacturer's products. Distributors or manufacturer's representatives shall not provide product training unless qualified as certified trainers by anchor manufacturer.

B. Certifications:
   1. Weld Procedures: For types of splices and grades of reinforcing used in the Work, weld procedures for welded reinforcing steel splices shall be certified in accordance with ANSI/AWS D1.4.
   2. Welders: For types of splices and grades of reinforcing used in the Work, welders shall be certified for welding reinforcing steel splices in accordance with ANSI/AWS D1.4.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Drawings for fabricating, bending, and placing concrete reinforcing. Comply with ACI 315, Parts A and B.
      b. For walls, show elevations at minimum scale of 1/4-inch to one foot.
         1) Elevations shall show all openings and reference details that identify additional reinforcing required around each opening.
         2) Elevations shall denote each wall intersection and reference a detail that identifies additional reinforcing required at wall intersection. As an alternate to providing separate details for each wall intersection, provide overall plan detailing only the additional wall intersection reinforcing for each wall intersection.
      c. For slabs and mats, show top and bottom reinforcing on separate plan views.
         1) Plans shall show all openings and shall reference details that identify additional reinforcing around each opening.
      d. Show bar schedules, stirrup spacing, diagrams of bent bars, location of bar splices, length of lap splices, arrangements, and assemblies, as required for fabricating and placing concrete reinforcing unless otherwise noted.
      e. Provide plans and elevations detailing location, spacing, and lengths of masonry wall dowels, where masonry is required. Coordinate location of dowels with masonry openings and with standard modular spacing. Submit masonry wall dowels with reinforcing submittal for element into which masonry dowel will be embedded. Coordinate with Section

04 05 05, Unit Masonry Construction.

f. Splices shall be kept to a minimum. Avoid, when possible, splices in regions of maximum tensile stresses.

g. Drawings detailing location of all construction and expansion joints, as required under Section 03 15 00, Concrete Accessories, shall be submitted and approved before Shop Drawings for reinforcing are submitted.

h. Drawings detailing location, spacing, edge distance, and embedment depth of adhesive dowels. Adhesive system shall be submitted and approved before Shop Drawings with adhesive dowels are submitted.

2. Product Data:

a. Manufacturer's product data for adhesive, if not submitted under other Sections.

b. Adhesive manufacturer's test data and ICC ES report to verify specified capacity of adhesive dowels.

B. Informational Submittals: Submit the following:

1. Certificates:

a. Steel manufacturer's certificates of mill analysis, tensile, and bend tests for reinforcing steel.

b. Certification of welders and weld procedures for splices.

c. Adhesive manufacturer's certification verifying that installer is qualified and using proper installation procedures.

2. Manufacturer's Instructions:

a. Installation instructions for adhesive systems.

3. Field Quality Control Submittals:

a. Reports of all field quality control testing, where applicable.

b. Results of required inspection of welded splices of reinforcing bars.

c. Results of required tensile testing of adhesive dowels. Include size and location of bars tested.

4. Special Procedure Submittals; Description of reinforcing weld locations and weld procedures.

1.5 DELIVERY, HANDLING, AND STORAGE

A. Deliver concrete reinforcing products to Site bundled, tagged, and marked. Use metal tags indicating bar size, lengths, and other information corresponding to markings on approved Shop Drawings.

B. Store concrete reinforcing products to prevent damage and accumulation of dirt and excessive rust. Store on heavy wood blocking so that reinforcing does not come into contact with the ground.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Reinforcing Bars: Shall be deformed in accordance with ASTM A615, and as follows:
   1. Provide Grade 60 for all bars, unless indicated otherwise.
   2. At beams and columns forming frames and wall boundary elements, where shown on the Drawings, provide ASTM A706 or ASTM A615, Grade 60, with tested actual maximum yield stress of 78,000 psi and ratio of actual tested tensile strength to tested yield strength not less than 1.25.
   3. Epoxy-coated reinforcing bars shall be in accordance with ASTM A775.
   4. Galvanized reinforcing bars shall be in accordance with ASTM A767, ACI 318, and ACI 350.

B. Mechanical Couplers: Reinforcement bars may be spliced with mechanical connection. Connection shall be full mechanical connection that shall develop in tension or compression, as required, at least 125 percent of specified yield strength (fy) of bar in accordance with ACI 318 and ACI 350. Where splices at the face of wall are shown or approved by ENGINEER, form saver-type mechanical couplers may be used. Form-saver couplers shall have integral plates designed to positively connect coupler to formwork.

C. Steel Wire: Shall be in accordance with ASTM A82.

D. Welded Smooth Wire Fabric: Shall be in accordance with ASTM A185.
   1. Furnish in flat sheets, not rolls.

E. Column Spirals: Hot-rolled rods for spirals, conforming to ASTM A615.

F. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting and fastening reinforcing in place.
   1. Use wire bar type supports complying with CRSI 1 MSP recommendations, except as specified in this Section. Do not use wood, brick, or other unacceptable materials.
   2. Over waterproof membranes, use precast concrete chairs.
   3. For epoxy-coated reinforcing, use wire reinforcing supports coated with dielectric material including epoxy or another polymer for minimum distance of two inches from point of contact with epoxy-coated reinforcement.

G. Adhesive Dowels:
   1. Dowels:
      a. Dowel reinforcing bars shall be deformed in accordance with ASTM A615, Grade 60.
   2. Adhesive:

a. Requirements for adhesive are specified under requirements for concrete adhesive anchors in Section 05 05 33, Anchor Systems.

2.2 FABRICATION

A. General: Fabricate reinforcing bars to conform to required shapes and dimensions, with fabrication tolerances complying with CRSI 1 MSP. In case of fabricating errors, do not re-bend or straighten reinforcing in manner that injures or weakens material.

B. Unacceptable Materials: Reinforcing with one or more of the following defects is not allowed:
   1. Bar lengths, bends, and other dimensions exceeding specified fabrication tolerances.
   2. Bends or kinks not shown on approved Shop Drawings.
   3. Bars that do not meet or exceed their ASTM specification requirements when hand-wire-brushed, with respect to cross section, nominal weight, or average height of deformations.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine the substrate and conditions under which concrete reinforcing is to be placed and notify ENGINEER in writing of unsatisfactory conditions. Do not proceed with Work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with applicable recommendations of Laws and Regulations, applicable standards, and CRSI 1 MSP for details and methods of reinforcing placement and supports.

B. Clean reinforcing to remove loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.

C. Position, support, and secure reinforcing against displacement during formwork construction and concrete placing. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.
   1. Place reinforcing to obtain minimum concrete coverages specified in ACI 318, AC I 350, and the Contract Documents. Arrange, space, and securely tie bars and bar supports together with 16-gage wire to hold reinforcing accurately in position during concrete placing. Set wire ties so that twisted ends are directed away from exposed concrete surfaces.
   2. Prior to placing concrete, using surveyor's level or string line, demonstrate to ENGINEER that specified cover of reinforcing has been attained.

3. Do not secure reinforcing steel to forms with wire, nails, or other ferrous metal. Metal supports subject to corrosion shall not touch formed or exposed concrete surfaces.

D. Allowable Placing Tolerances: Comply with ACI 318, Chapter 7 - Details of Reinforcement, and ACI 350, Chapter 7 - Details of Reinforcement, except as specified in this Section:
   1. Concrete surfaces in contact with liquid shall have minimum of two inches of concrete over reinforcing steel.

E. Provide sufficient number of supports of strength required to carry reinforcing. Do not place reinforcing bars more than two inches beyond last leg of continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.

F. Lap Splices:
   1. Provide standard reinforcing splices by lapping ends, placing bars in contact, and tying tightly with wire. Comply with requirements shown for minimum lap of spliced bars as shown on the Drawings.

G. Install welded wire fabric in lengths as long as practical. Lap adjoining pieces at least one full mesh and lace splices with 16-gage wire. Do not make end laps midway between supporting beams, or directly over beams of continuous structures. Offset end laps in adjacent widths to prevent continuous laps.

H. Mechanical Couplers:
   1. Mechanical butt splices shall be in accordance with recommendations of mechanical splicing device manufacturer. Butt splices shall develop 125 percent of specified minimum yield tensile strength of spliced bars or of smaller bar in transition splices. Bars shall be flame-dried before butt splicing. Provide adequate jigs and clamps or other devices to support, align, and hold longitudinal centerline of bars being butt spliced in straight line.

I. Welded Splices:
   1. When field welding of reinforcing is required on the Drawings or allowed by ENGINEER in writing, welding of reinforcing bars shall conform to ANSI/AWS D1.4. Preheating and rate of cooling requirements shall be based on bar steel chemistry and ANSI/AWS D1.4. Welded splices shall be sized and constructed to transfer minimum of 125 percent of specified minimum yield tensile strength of spliced bars or of smaller bar in transition splices. Unless otherwise allowed by ENGINEER in writing, welding of crossing bars (tack welding) for assembly of reinforcement is prohibited.
   2. Welding of wire to wire, and of wire or welded wire fabric to reinforcing bars or structural steels, shall conform to applicable provisions of ANSI/AWS D1.4 and ENGINEER's requirements for the particular application.

3. After completing welding on coated reinforcing bars, repair coating damage as specified in this Section. Welds and steel splice members, when used to splice bars, shall be coated with same material used for repair of coating damage.

J. Adhesive Dowels:
1. Comply with manufacturer's written installation instructions and requirements of this Section.
2. Drill holes to adhesive system manufacturer's recommended drill bit diameter and to specified depth. Drill holes in hammering and rotation mode with carbide-tipped drill bits complying with tolerances indicated in ANSI B212.15. Core-drilled holes shall not be permitted.
3. Before setting adhesive dowel, hole shall be made free of dust and debris by method recommended by adhesive system manufacturer. Brush the hole with adhesive system manufacturer-approved brush and blow hole clean with clean, dry, oil-free compressed air to remove all dust and loose particles. Hole shall be dry as defined by adhesive system manufacturer.
4. Before injecting adhesive, obtain ENGINEER's concurrence that hole is dry and free of oil and other contaminants.
5. Prior to injecting adhesive into the drilled hole, dispense to an appropriate location for waste an initial amount of adhesive from the mixing nozzle until adhesive is a uniform color, indicating that product is properly mixed.
6. Inject adhesive into hole through injection system-mixing nozzle and extension tubes (as required) placed to bottom of hole. Withdraw nozzle's discharge end as adhesive is placed while keeping nozzle immersed to prevent formation of air pockets. Fill hole to depth that ensures that excess material is expelled from hole during dowel placing.
7. Twist dowel during insertion into partially-filled hole to ensure full wetting of rod surface with adhesive. Insert rod slowly to avoid developing air pockets.
8. Provide adequate curing in accordance to adhesive system manufacturer's requirements prior to continuing with adjoining or adjacent Work that could impose or impart load on the dowels. Do not begin adjoining or adjacent Work until dowels are successfully tested or when approved by ENGINEER.
9. Limitations:
   a. Installation Temperature: Comply with manufacturer's instructions for installation temperature requirements. Provide temporary protection and other measures, such as heated enclosures, necessary to ensure that base material temperature complies with requirements of adhesive systems manufacturer during installation and adhesive system curing.
   b. Oversized Holes: Advise ENGINEER immediately if size of drilled hole is larger than recommended by adhesive system manufacturer. Cost of corrective measures, including but not limited to redesign of dowels due to decreased capacities, shall be paid by CONTRACTOR.

3.3 FIELD QUALITY CONTROL

A. Site Inspections and Tests:
1. General:

a. Do not place concrete until reinforcing is inspected, and permission for placing concrete is granted by ENGINEER. Concrete placed in violation of this provision will be rejected.
b. Do not close up formwork for walls and other vertical members until reinforcing is inspected, and permission for placing concrete is granted by ENGINEER. Concrete placed in violation of this provision will be rejected.
c. Correct defective Work by removing and replacing or correcting, as required by ENGINEER.
d. CONTRACTOR shall pay cost of corrections and subsequent testing required to confirm integrity of post-installed anchors.
e. Testing laboratory shall submit test results to CONTRACTOR and ENGINEER within 24 hours of completion of test.

2. Site Tests:
   a. CONTRACTOR shall employ testing laboratory to perform field quality testing of adhesive dowels at the Site.
      1) Testing shall comply with ASTM E488.
      2) Test at least ten percent of each type of adhesive dowel. If one or more dowels fail the test, CONTRACTOR shall pay cost to test all dowels of same diameter and type installed on the same day as the failed dowel.
      3) Test dowels to 60 percent of specified yield strength. ENGINEER will direct which dowels are to be tested.
      4) Apply test loads with hydraulic ram.
      5) Displacement of dowels shall not exceed D/10, where D is nominal diameter of dowel.
3. Inspection of Welded Splices: CONTRACTOR shall employ testing laboratory to perform field quality control testing of welded splices. All welded splices shall be visually inspected. Radiographically test minimum of five percent of butt splice welds. Repair defective welds so that welds are completely sound.

+ + END OF SECTION + +

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install cast-in-place concrete.
   2. The Work includes providing concrete consisting of portland cement, fine and coarse aggregate, water, and approved admixtures; combined, mixed, transported, placed, finished, and cured. The Work also includes:
      a. Providing openings in concrete to accommodate the Work under this and other Sections, and building into the concrete all items such as sleeves, frames, anchorage devices, inserts, and all other items to be embedded in concrete Work.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate installation of items to be installed in the concrete Work.

C. Classifications of Concrete:
   1. Class "A" concrete shall be steel-reinforced and includes the following:
      a. All concrete, unless otherwise shown or indicated.
   2. Class "AF" concrete shall be steel-reinforced and may be used in lieu of Class "A" concrete for the following:
      a. Walls and foundations thicker than 16 inches.
   3. Class "AS" concrete shall be steel-reinforced and provided, where shown or indicated, for slabs not exposed to freezing and thawing where troweled finish is required.
   4. Class "B" concrete shall be placed without forms or with simple forms, with little or no reinforcing, and includes the following, unless otherwise shown or indicated:
      a. Concrete fill within structures.
      b. Duct banks.
      c. Unreinforced encasements.
      d. Curbs and gutters.
      e. Sidewalks.
      f. Thrust blocks.
   5. Class "C" concrete shall be steel-reinforced and provided where shown or indicated for slabs that require enhanced durability against wear.
   6. Class "D" concrete shall be unreinforced and used where required as concrete fill under foundations, filling abandoned piping, and where "lean concrete" or "mudmat" is shown or indicated in the Contract Documents.
   7. Lightweight Structural Concrete: Shall be used where shown or indicated.

D. Related Sections:
   1. Section 03 15 00, Concrete Accessories.
   2. Section 03 60 00, Grouting.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. AASHTO M 182, Specification for Burlap Cloth Made From Jute or Kenaf and Cotton Materials.
   2. AASHTO TP23, Test Method for Water Content of Freshly Mixed Concrete Using Microwave Oven Drying.
   3. ACI 117, Specifications for Tolerances for Concrete Construction and Materials and Commentary.
   4. ACI 214R, Evaluation of Strength Test Results of Concrete.
   5. ACI 301, Specifications for Structural Concrete.
   6. ACI 302.1R, Guide for Concrete Floor and Slab Construction.
   7. ACI 304R, Guide for Measuring, Mixing, Transporting and Placing Concrete.
   8. ACI 305R, Specification for Hot Weather Concreting.
   9. ACI 306R, Cold Weather Concreting.
   10. ACI 309R, Guide for Consolidation of Concrete.
   11. ACI 318, Building Code Requirements for Structural Concrete and Commentary.
   12. ACI 350/350R, Code Requirements for Environmental Engineering Concrete Structures and Commentary.
   13. ASTM C31/C31M, Practice for Making and Curing Concrete Test Specimens in the Field.
   14. ASTM C33, Specification for Concrete Aggregates.
   15. ASTM C39/C39M, Test Method for Compressive Strength of Cylindrical Concrete Specimens.
   16. ASTM C42/C42M, Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
   17. ASTM C94/C94M, Specification for Ready-Mixed Concrete.
   18. ASTM C109/C109M, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).
   19. ASTM C138/C138M, Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
   20. ASTM C143/C143M, Test Method for Slump of Hydraulic- Cement Concrete.
   21. ASTM C150, Specification for Portland Cement.
   22. ASTM C157/C157M, Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete.
   23. ASTM C171, Specification for Sheet Materials for Curing Concrete.
   24. ASTM C172, Practice for Sampling Freshly Mixed Concrete.
   25. ASTM C231, Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
   26. ASTM C260, Specification for Air-Entraining Admixtures for Concrete.
   27. ASTM C309, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

28. ASTM C330, Specification for Lightweight Aggregates for Structural Concrete.
29. ASTM C494/C494M, Specification for Chemical Admixtures for Concrete.
30. ASTM C618, Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
31. ASTM C882/C882M, Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.
32. ASTM C989, Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
33. ASTM C1064/C1064M, Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
34. ASTM C1077, Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
35. ASTM C1240, Specification for Silica Fume Used in Cementitious Mixtures.
36. ASTM D1042, Test Method for Linear Dimensional Changes of Plastics Under Accelerated Service Conditions.
37. ASTM D3574, Standard Test Methods for Flexible Cellular Materials—Slab, Bonded, and Molded Urethane Foams.
38. ASTM E96/E96M, Test Methods for Water Vapor Transmission of Materials
39. ASTM E329, Specification for Agencies Engaged in Construction Inspection and/or Testing.
40. ASTM E1643, Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
41. ASTM E1745, Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
42. NSF/ANSI 61, Drinking Water System Components - Health Effects.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Concrete Testing Laboratory:
      a. Employ independent testing laboratory experienced in design and testing of concrete materials and mixes to perform material evaluation tests and to design concrete mixes. Employ different laboratories for design of concrete mixes and field testing.
         1) Testing agency shall be in accordance with ASTM E329 and ASTM C1077.
         2) Testing laboratory shall have been inspected and passed within previous two years by Cement and Concrete Reference Laboratory (CCRL) of NIST for: testing concrete aggregates, and for preparing and testing concrete trial batches with or without admixtures. Testing laboratory shall provide documentation indicating how deficiencies, if any, in most recent CCRL inspection report were corrected.
         3) Selection of testing laboratory is subject to DEPARTMENT's acceptance.
         4) Submit written description of proposed concrete testing laboratory giving qualifications of personnel, laboratory facilities, and equipment, and other information requested by ENGINEER.

2. Water Reducing Admixture Manufacturer:
    a. Water-reducing admixtures shall be manufactured under strict quality control in facilities operated under a quality assurance program. Submit copy of manufacturer's quality assurance handbook to document program existence.
    b. Manufacturer shall maintain a concrete testing laboratory approved by CCRL at NIST.
    c. Manufacturer shall be capable of providing services of qualified field service representatives at the Site.

B. Laboratory Trial Batch:
1. Each concrete mix design specified shall be verified by laboratory trial batch, unless indicated otherwise.
2. For classes of concrete that require air-entrainment, test the trial batch at highest percentage of air allowed for that class of concrete.
3. Perform the following testing on each trial batch:
    a. Aggregate gradation for fine and coarse aggregates.
    b. Fly ash testing to verify meeting specified properties, unless fly ash Supplier submits certification by an independent testing laboratory.
    c. Slump.
    d. Air content.
    e. Compressive strength based on three cylinders each tested at seven days and at 28 days.
    f. Shrinkage test in accordance with this Section, for Class "A" concrete and Class "AF" concrete.
4. Submit for each trial batch the following information:
    a. Project identification name and number (if applicable).
    b. Date of test report.
    c. Complete identification of aggregate source of supply.
    d. Tests of aggregates for compliance with the Contract Documents.
    e. Scale weight of each aggregate.
    f. Absorbed water in each aggregate.
    g. Brand, type, and composition of cementitious materials.
    h. Brand, type, and amount of each admixture.
    i. Amounts of water used in trial mixes.
    j. Proportions of each material per cubic yard.
    k. Gross weight and yield per cubic yard of trial mixtures.
    l. Measured slump.
    m. Measured air content.
    n. Compressive strength developed at seven days and 28 days, from not less than three test cylinders cast for each seven day and 28 day test, and for each design mix.
    o. Shrinkage test results where required and as specified in this Section. Report results and averages for original length and at zero, seven, 14, 21, and 28 days of drying.

C. Certification of Concrete Mix:
   1. The requirement for trial batch will be waived upon compliance with requirements of this Paragraph. Verify compressive strength of each specified mix by data from series of at least 30 consecutive tests that have been made within previous 12 months. Test is the average strength of all specimens of the same age fabricated from sample taken from a single batch of concrete. Tests shall have been made on concrete with identical mix design to mix design proposed for the Work, including sources of aggregate and manufacturers of cementitious materials and admixtures. Tests shall average above specified strength with no individual test falling more than 500 psi below specified strength and no three consecutive tests averaging below specified strength. Standard deviation for series of tests shall not exceed 640 psi in accordance with ACI 214.

D. Shrinkage Test:
   1. Perform drying shrinkage tests for trial batch as specified in this Section.
   2. Drying shrinkage specimens shall be four-inch by four-inch by 11-inch prisms with effective gage length of ten inches; fabricated, cured, dried, and measured in accordance with ASTM C157 modified as follows: remove specimens from molds at an age of 23 hours, plus-or-minus one hour, after trial batching; shall be placed immediately in water at 70 degrees F plus-or-minus three degrees F for at least 30 minutes; and shall be measured within 30 minutes thereafter to determine original length and then submerged in saturated lime water at 73 degrees F plus-or-minus three degrees F. Measurement to determine expansion expressed as percentage of original length shall be made at age of seven days. Length at age of seven days shall be base length for drying shrinkage calculations (zero days drying age). Immediately afterward store specimens in humidity-controlled room maintained at 73 degrees F plus-or-minus three degrees F, and 50 percent (plus-or-minus four percent) relative humidity for remainder of test. Obtain measurements to determine shrinkage expressed as percentage of base length and report measurements separately for seven, 14, 21, and 28 days of drying after seven days of moist curing.
   3. Determine drying shrinkage deformation of each specimen as the difference between base length (at zero days drying age) and length after drying at each test age. Determine average drying shrinkage deformation of specimens to nearest 0.0001-inch at each test age. If drying shrinkage of a specimen departs from average of that test age by more than 0.0004-inch, results obtained from that specimen shall be disregarded. Report results of shrinkage test to nearest 0.001 percent of shrinkage. Compression test specimens shall be taken in each case from same concrete used for preparing drying shrinkage specimens. Tests shall be considered part of normal compression tests for the Work. Allowable shrinkage limitations shall be as specified in Part 2 of this Section.

E. Component Supply and Compatibility:
   1. Provide all admixture materials from a single manufacturer.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. List of concrete materials and proportions for the proposed concrete mix designs. Include data sheets, test results, certifications, and mill reports to qualify the materials proposed for use in the mix designs. Do not start laboratory trial batch testing until this submittal is approved by ENGINEER.
      b. Laboratory Trial Batch Reports: Submit laboratory test reports for concrete cylinders, materials, and mix design tests.
      c. Ready-mixed Concrete: Submit the following information.
         1) Physical capacity of mixing plant.
         2) Trucking facilities available.
         3) Estimated average amount of the specified concrete that can be produced and delivered to the Site during a normal, eight-hour day, excluding output to other customers.
   2. Product Data:
      a. Manufacturers' specifications with application and installation instructions for proprietary materials and items, including admixtures and bonding agents.
   3. Samples:
      a. Submit Samples of materials as specified and as requested by ENGINEER. Include with each Sample names of product and Supplier, and description.

B. Informational Submittals: Submit the following:
   1. Certifications:
      a. Notarized certification of conformance to reference standards used in this Section, when required by ENGINEER.
   2. Delivery Tickets: Copies of all delivery tickets for each load of concrete delivered to or mixed at the Site. Each delivery tickets shall contain the information in accordance with ASTM C94 along with project identification name and number (if any), date, mix type, mix time, quantity and amount of water introduced.
   3. Field Quality Control Submittals:
      a. Report of testing results for testing of field concrete cylinders for each required time period. Submit within 24 hours after completion of associated test. Test report shall include results of all testing required at time of sampling.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Transportation, Delivery, and Handling:
   1. Materials used for concrete shall be clean and free from foreign matter during transportation and handling, and kept separate until measured and placed into concrete mixer.

2. Implement suitable measures during hauling, piling, and handling to ensure that segregation of coarse and fine aggregate particles does not occur and grading is not affected.

B. Storage:
1. For storage, provide bins or platforms with hard, clean surfaces.

PART 2 – PRODUCTS

2.1 CEMENTITIOUS MATERIALS

A. Cement:
1. Portland cement shall be Type II(MH) ASTM C150. Type I or Type II may be used in lieu of Type II(MH) when approved by ENGINEER.
2. Portland cement shall be produced by one facility. Alternate cement sources may be used provided that mix design has been approved and acceptable trial batch verifying performance has been made.
3. Do not use cement that has deteriorated because of improper storage or handling.

B. Fly Ash Mineral Admixture:
1. Mineral admixtures, when used, shall conform to the requirements of ASTM C618 Class F, except as follows:
   a. The loss on ignition shall be a maximum of four percent.
   b. The maximum percent of sulfur trioxide (SO3) shall be 4.0.
2. Fly ash shall be considered to be a cementitious material.
3. Laboratory trial batches shall be tested to determine compliance with strength requirements, times of setting, slump, slump loss, and shrinkage characteristics.

C. Ground Granulated Blast Furnace Slag:
1. Ground granulated blast furnace slag (GGBS) mineral admixture, when used, shall conform to ASTM C989, Grade 120.
2. GGBS is considered a cementitious material.
3. Perform laboratory tests on trial batches to determine compliance with strength requirements, times of setting, slump, slump loss, and shrinkage characteristics.

D. Silica Fume Mineral Admixture:
1. Silica fume mineral admixture shall be dry compacted or slurry form and shall conform to ASTM C1240. Silica fume is considered a cementitious material. Application rate shall be seven percent by weight of cement, unless indicated otherwise.

E. For all classes of concrete, when Type II(MH) Cement is used, fly ash or GGBS may be used within the following percentages by weight. When Type II Cement is used, fly ash or GGBS shall be used within the following percentages by weight. When Type I Cement is used, in lieu of Type II(MH) Cement, fly ash or GGBS shall be

used such that total tricalcium aluminate content (C3A) of the resulting cementitious material is not greater than eight percent.

1. When fly ash is used, material shall have minimum of 20 percent and maximum of 25 percent of total weight of cementitious material.
2. When GGBS is used, material shall have minimum of 40 percent and maximum of 50 percent of total weight of cementitious material.

2.3 AGGREGATES

A. General:
   1. Aggregates shall conform to ASTM C33, Class Designation 4S, and as specified in this Section.
   2. Do not use aggregates containing soluble salts or other substances, such as iron sulfides, pyrite, marcasite, ochre, or other materials, that can cause stains on exposed concrete surfaces.

B. Fine Aggregate:
   1. Provide clean, sharp, natural sand free of loam, clay, lumps, and other deleterious substances.
   2. Dune sand, bank run sand, and manufactured sand are unacceptable.

C. Coarse Aggregate:
   1. Provide clean, uncoated, processed aggregate containing no clay, mud, loam, or foreign matter, as follows:
      a. Crushed stone, processed from natural rock or stone.
      b. Washed gravel, either natural or crushed. Slag, pit gravel, and bank run gravel are unacceptable.
      c. Lightweight Aggregate: ASTM C330.

2.4 WATER

A. Water used in producing and curing concrete shall be clean and free of injurious quantities of oils, acids, alkalis, organic materials, and other substances that may be deleterious to concrete and steel.

2.5 CONCRETE ADMIXTURES

A. Provide admixtures in accordance with product manufacturer's published instructions. Admixtures shall be compatible with each other. Admixtures shall not contain thiocyanates, shall not contain more than 0.05 percent chloride ion, and shall be non-toxic in the concrete mix after 30 days. Do not use admixtures that have not been incorporated and tested in the accepted mixes, unless otherwise approved by ENGINEER.

B. Air Entraining Admixtures: ASTM C260.
   1. Air entraining admixture shall be vinsol resin or vinsol rosin-based.

C. Water-Reducing Admixture: ASTM C494, Type A.
   1. Proportion Class “A”, Class “AF”, Class “AS”, and Class “B” concrete with non-air entraining, normal setting, water-reducing, aqueous solution of modified organic polymer. Admixture shall not contain lignin, nitrates, or chlorides added during manufacturing.

D. High Range Water-Reducing Admixture (HRWR): ASTM C494, Type F/G.
   1. Use high range water-reducing admixture in the concrete classifications so specified or indicated. Use of HRWR admixture is allowed at CONTRACTOR’S option in all other classifications of concrete. When used, HRWR admixture shall be added to concrete in accordance with admixture manufacturer’s published instructions. Specific admixture formulation shall be as recommended by admixture manufacturer for Project conditions.

E. Set Control Admixtures: In accordance with ASTM C494. Use the following as required:
   1. Type B, Retarding.
   2. Type C, Accelerating.
   3. Type D, Water reducing and Retarding.
   4. Type E, Water reducing and Accelerating.
   5. Type F, Water-reducing, high range admixtures.
   6. Type G, Water-reducing, high range, and retarding admixtures.

F. Calcium Chloride: Do not use calcium chloride.

G. Shrinkage Reducing Admixture:
   1. Shrinkage reducing admixture may be used in mix design when necessary to conform to specified shrinkage limitations, provided that specified strength requirements are complied with and there is no reduction in sulfate resistance in the concrete and no increase in concrete permeability.

2.6 PROPORTIONING AND DESIGN OF MIXES

A. Prepare concrete design mixes in accordance with Table 03 30 00-A:

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TABLE 03 30 00-A
CONCRETE DESIGN MIX CRITERIA

Concrete Class	Coarse Aggregate[1]		Minimum Cementitious (lbs/cu yd)	Max. W/CM[4]	Slump[2]	Air (%)	Min. Comp Strength[3] (psi)
	Size A	Size B					
Class "A"	No. 57	No. 8	564	0.42	4" max.	6 +/- 1	4,500
Class "AF"	No. 467	No. 8	517	0.42	4" max.	5 +/- 1	4,500
Class "AS"	No. 57	No. 8	564	0.42	4" max.	-	4,500
Class "B"	No. 57 or No. 67		517	0.50	4" max.	6 +/- 1	3,000
Class "C"	N. 57 or No. 67		564	0.40	4" max.	3 Max.	5,000
Class "D"	Any ASTM C33		← No requirements →				2,000

Notes Applicable to Table 03 30 00-A:

1. Coarse aggregate size numbers refer to ASTM C33. Where Size A and B are designated in Table 03 30 00-A, it is intended that the smaller Size B aggregate is to be added, replacing a portion of the coarse or fine aggregate, in the minimum amount necessary to make a workable and pumpable mix with sand content not exceeding 41 percent of total aggregate.
2. Slumps indicated are prior to addition of high range water reducer (super plasticizer).
3. Mix designs shall be made for all but Class "D", which does not require trial batch, so that the compressive strength achieved for laboratory trial batches will not be less than 125 percent of specified design strength.
4. Quantity of water to be used in the determination of water-cementitious materials (W/CM) ratio shall include free water on aggregates in excess of SSD and water portion of admixtures.

B. Lightweight Concrete: Proportion the mix as specified in this Section:
   1. Specified 28-day Compressive Strength: 4,000 psi.
   2. Maximum Water-Cement Ratio by Weight: 0.45.
   3. Maximum Coarse Aggregate Size: 3/4-inch.
   4. Minimum Cement Content: 564 pounds per cubic yard of concrete.
   5. Percent Air Content: Six percent, plus-or-minus one percent.
   6. Dry weight of not less than 95 pounds per cubic foot (pcf) or not more than 110 pcf after 28 days.
   7. Limit drying shrinkage to 0.05 percent at 28 days.

C. Adjustment to Concrete Mixes: Mix design adjustments may be requested by CONTRACTOR when characteristics of materials, Site conditions, weather, test results, or other circumstances warrant; at no additional cost to DEPARTMENT and as approved by ENGINEER. Before using adjusted concrete mixes, laboratory test data and strength results shall be submitted to and approved by ENGINEER.

D. Admixtures:
   1. Use air-entraining admixture in concrete, unless otherwise shown or indicated. Add air-entraining admixture at admixture manufacturer's prescribed rate to produce concrete at point of placement having air content within prescribed limits.
   2. Use water-reducing or high-range water-reducing admixtures in all Class "A" and Class "AF" concrete.
   3. Use amounts of admixtures recommended by admixture manufacturer for climatic conditions prevailing at the Site at time of placing. Adjust quantities and types of admixtures as required to maintain quality.

E. If adding water at the Site is desired, withhold water at the batch plant so that specified water-cement (or cementitious material) ratio is not exceeded. Addition of water shall be accordance with ASTM C94. After high-range water-reducing admixture is incorporated into the batch, addition of water is not allowed.

F. Slump Limits with High-Range Water Reducer:
   1. Slump shall not exceed four inches prior to adding high-range water reducer and shall not exceed eight inches, measured at point of placement, after adding high-range water reducer.

G. Shrinkage Limitation:
   1. Concrete shrinkage for specimens cast in laboratory from trial batch with total water of 30.2 gallons per cubic yard or less, as measured at 21-day drying age and at 28-day drying age shall not exceed 0.039 percent and 0.045 percent, respectively. For trial batch with total water of 32.7 gallons per cubic yard or greater respective limits shall not exceed 0.035 percent and 0.040 percent. Limits in between shall be linear interpolated. Use mix design for construction that complies with trial batch shrinkage requirements. Shrinkage limitations apply to Class "A" concrete and Class "AF" concrete.
   2. Trial Batch Does Not Comply with Shrinkage Limitation:
      a. If trial batch results do not comply with shrinkage limitation specified in the Contract Documents, redesign the mix to reduce shrinkage.
      b. After mix has been repeatedly redesigned and ENGINEER is satisfied that all reasonable means to provide concrete mix that complies with shrinkage requirement have been exercised; and mix design still fails to comply with shrinkage limitation in the Contract Documents, ENGINEER reserves the right to accept the higher-shrinkage mix, provided that the quantity of shrinkage reinforcing in structures is increased.
      c. "Reasonable means" will be construed as reducing the total water content to a maximum of 27 gallons per cubic yard, having the large aggregate blended so that eight percent to 18 percent of combined aggregate is retained on each sieve, using an alternate aggregate source, and a combination of these means.
      d. Basis for shrinkage reinforcing increase will be proportional to amount that shrinkage value is over the specified shrinkage limitation and will be

determined by ENGINEER. The cost of providing additional shrinkage reinforcement will be paid by the Owner.

2.7 BONDING AGENT

A. Provide epoxy and epoxy-cement bonding agents in accordance with Section 03 15 00, Concrete Accessories.

2.8 CONCRETE CURING MATERIALS

A. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 10 ounces per square yard and complying with AASHTO M 182, Class 3.

B. Curing Mats: Shall be heavy carpets or cotton mats, quilted at four inches on centers, and weighing minimum of 12 ounces per square yard when dry.

C. Moisture-Retaining Cover: Provide one of the following, complying with ASTM C171:
   1. Waterproof paper.
   2. Polyethylene film.
   3. White burlap polyethylene sheet.

D. Liquid Curing Compound: ASTM C309 Type 1-D (water retention requirements):
   1. Provide fugitive dye.
   2. Curing compound shall be applied by roller or power sprayer.

2.9 FINISHING AIDS

A. Evaporation Retardant:
   1. Product and Manufacturer: Provide one of the following:
      a. Confilm, by Master Builders.
      b. Eucobar, by Euclid Chemical Company.
      c. SikaFilm, by Sika Corporation.
      d. Or equal.

2.10 CRACK INJECTION MATERIALS

A. Structural Crack Repair System:
   1. Epoxy for Injection: Low-viscosity, high-modulus moisture insensitive type.
   2. Products and Manufacturers: Provide one of the following:
      a. Sikadur 35, Hi-Mod L.V. and Sikadur 31, Hi-Mod Gel, by Sika Corporation.
      b. Eucopoxy Injection Resin, by Euclid Chemical Company.
      c. Or equal.

B. Non-structural Crack Repair System:
   1. Hydrophobic Polyurethane Chemical Grout:
      a. Provide hydrophobic polyurethane that forms a flexible gasket.

b. Products and Manufacturers: Provide one of the following:
   1) SikaFix HH LV, by Sika Chemical Company.
   2) Hydro Active Flex SLV, by De Neef Construction Chemicals, Inc.
   3) Or equal.
c. Shrinkage limit shall not exceed 4.0 percent in accordance with ASTM D1042.
d. Minimum elongation of 250 percent in accordance with ASTM D3574.
e. Minimum tensile strength of 150 psi in accordance with ASTM D3574.

2. Hydrophilic Acrylate-Ester Resin:
   a. Hydrophilic crack repair system shall be acrylate-ester resin that forms a flexible gasket and increase in volume a minimum of 50 percent when in contact with water.
   b. Products and Manufacturers: Provide one of the following:
      1) Duroseal Multigel 850, manufactured by BBZ USA, Inc.
      2) Or equal.

2.11 CONCRETE REPAIR MATERIALS

A. Concrete repair mortar shall be pre-packaged, polymer-modified cementitious repair mortar with the following minimum properties:
   1. Compressive Strength at One Day: 2,000 psi (ASTM C109).
   2. Compressive Strength at 28 Days: 6,000 psi (ASTM C109).
   3. Bond Strength at 28 Days: 1,800 psi (ASTM C882 modified).

B. Products and Manufacturers: Provide one of the following:
   1. Five Star Structural Concrete, by Five Star Products, Inc. Use formulation recommended by manufacturer for the specific application conditions.
   2. SikaTop 122 Plus, SikaTop 123 Plus, SikaTop 111 Plus, or Sikacem 133, by Sika Corporation. Use formulation from among those listed in this paragraph recommended by manufacturer for specific application conditions.
   3. Emaco S88-CA or S66-CR, by Master Builders Inc. Use formulation from among those listed in this paragraph recommended by manufacturer for specific application conditions.
   4. Verticoat, Verticoat Supreme, or Euco SR-VO, by Euclid Chemical Company. Use formulation from among those listed in this paragraph recommended by manufacturer for specific application conditions.
   5. Or equal.

C. Cement Mortar: Shall consist of mix of one part cement to 1.5 parts sand with sufficient water to form trowelable consistency. Minimum compressive strength at 28 days shall be 4,000 psi. Where required to match the color of adjacent concrete surfaces, blend white portland cement with standard portland cement so that, when dry, patching mortar matches the color of surrounding concrete.

2.12 CHEMICAL HARDENER

A. Provide clear chemical hardener of fluosilicate family.

B. Product and Manufacturer: Provide one of the following:
   1. Lapidolith, by Sonneborn ChemRex Inc.
   2. Hornolith, by A.C. Horn, Inc.
   3. Or equal.

2.13 SHAKE-ON METALLIC HARDENER

A. Provide metallic hardener formulated, processed, and packaged under stringent quality control at metallic hardener manufacturer-owned and -controlled factory. Hardener shall be a mixture of specially-processed and -graded aggregate, selected portland cement, and plasticizing agents.

B. Product and Manufacturer: Provide one of the following:
   1. Euco-Plate H.D., by Euclid Chemical Company.
   2. Masterplate 200, by Master Builders, Inc.
   3. Or equal.

2.14 VAPOR RETARDER

A. Vapor Retarder:
   1. Vapor retarder membrane shall comply with the following.
      a. Water Vapor Transmission Rate, ASTM E96: 0.04 perms or lower.
      b. Water Vapor Retarder, ASTM E1745: Meets or exceeds Class C.
      c. Thickness of Retarder (plastic), ACI 302 1R: Not less than 10 mils.
   2. Products and Manufacturers: Provide one of the following:
      a. Stego Wrap 10-mil Vapor Retarder, by Stego Industries LLC.
      b. Griffolyn 10-mil, by Reef Industries.
      c. Moistop Ultra, by Fortifiber Industries.
      d. Or equal.

B. Accessories:
   1. Provide accessories by same manufacturer as vapor retarder.
   2. Seam Tape:
      a. Tape shall have water vapor transmission rate (ASTM E96) of 0.3 perms or lower.
      b. Products and Manufacturers: Provide one of the following:
         1) Stego Tape by Stego Industries LLC.
         2) Griffolyn Fab Tape by Reef Industries.
         3) Moistop Tape by Fortifiber Industries.
         4) Or equal.
   3. Vapor Proofing Mastic:
      a. Mastic shall have a water vapor transmission rate ASTM E96, 0.3 perms or lower.
   4. Pipe Boots:
      a. Construct pipe boots from vapor barrier material, pressure sensitive tape, mastic, or a combination thereof, in accordance with manufacturer's recommendations.

2.15 SOURCE QUALITY CONTROL

A. Concrete materials may require testing, as directed by ENGINEER, at any time during the Work if concrete quality is in question. Provide access to material stockpiles and facilities at all times. Tests shall be done at no expense to DEPARTMENT.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine the substrate and conditions under which the Work will be performed and notify ENGINEER in writing of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.2 CONCRETE MIXING

A. General:
   1. Concrete may be produced at batch plants or by the ready-mixed process. Batch plants shall comply with recommendations of ACI 304R and have sufficient capacity to produce concrete of qualities required and in quantities required to comply with the accepted Progress Schedule. All plant facilities are subject to acceptance of ENGINEER.
   2. Mixing:
      a. Mix concrete with a rotating type batch machine, except where hand mixing of very small quantities is approved by ENGINEER.
      b. Remove hardened accumulations of cement and concrete from drum and blades to ensure proper mixing action.
      c. Replace mixer blades upon loss of ten percent of mixer blades' original height.

B. Site Mixing:
   1. When Site mixing of concrete is approved by ENGINEER mix all materials for concrete in a drum-type batch mixer.
      a. For mixers of one cubic yard or smaller capacity, continue mixing at least 1.5 minutes but not more than five minutes after all ingredients are in the mixer, before any part of batch is released.
      b. For mixers of capacity larger than one cubic yard, increase minimum 1.5 minutes of mixing time by 15 seconds for each additional cubic yard or fraction thereof.
   2. Do not exceed mixer manufacturer's published rating of the mixer, or mixer nameplate capacity, for total volume of materials used per batch.
   3. Equip mixer with automatic controls for proportioning materials and proper, measured quantities.
   4. Do not exceed 45 minutes total elapsed time between intermingling of damp aggregates and cement to discharge of completed mix.

C. Ready-Mix Concrete:
   1. Comply with ASTM C94 and the Contract Documents.
      a. Plant Equipment and Facilities: Conform to requirements of NRMCA certification.
      b. Mix concrete in revolving-type truck mixers that are in good condition and produce thoroughly-mixed concrete conforming to the Contract Documents.
      c. Do not exceed rated capacity of mixer.
      d. Mix concrete for minimum of two minutes after arrival at the Site, or as recommended by mixer manufacturer.
      e. Do not allow drum to mix while in transit.
      f. Mix at proper speed until concrete is discharged from mixer.
      g. Maintain adequate facilities at the Site for continuous delivery of concrete at required rates.
      h. Provide access to mixing plant for ENGINEER upon request.
   2. When silica fume is used in dry compacted form, comply with the following mix requirements and ensure full dispersion:
      a. For all types of mixing equipment, increase mix times by 40 percent over minimum mix time required to achieve mix uniformity defined in ASTM C94.
      b. For truck-mixed and central-mixed concrete, maximum allowable batch size shall be 80 percent of maximum in accordance with ASTM C94.

D. Maintain equipment in proper operating condition, with drums cleaned before charging each batch. Schedule rates of delivery to prevent delay of placing concrete after mixing, or holding dry-mixed materials too long in mixer before the adding water and admixtures.

3.3 TRANSPORTING CONCRETE

A. Transport and place concrete not more than 90 minutes after water has been added to the dry ingredients.

B. Avoid spilling and separation of concrete mixture during transportation.

C. Do not place concrete in which the ingredients have separated.

D. Do not retemper partially set concrete.

E. Use suitable equipment for transporting concrete from mixer to forms.

3.4 PREPARATION FOR CONCRETING

A. Submit to ENGINEER laboratory trial batch test results for proposed mixes at least 15 days prior to start of Work. Do not begin concrete production until associated laboratory trial batch test result submittal has been approved by ENGINEER.

B. Notify ENGINEER a minimum of 24 hours in advance of placing concrete to allow for inspection of form work, joints, waterstops, reinforcement, embedded items, and vapor retarders. The section to be placed shall be fully prepared for concrete placement at the time of notice. Confirm inspection status with ENGINEER a minimum of 4 hours prior to concrete placement. Do not begin placing concrete until Work is in conformance with the Contract Documents.

C. Subgrade surfaces shall be thoroughly wetted by sprinkling, prior to the placing of any concrete, and these surfaces shall be kept moist by frequent sprinkling up to the time of placing concrete thereon. The surface shall be free from standing water, mud, and debris at the time of placing concrete.

D. Reinforcing steel and embedded items shall be completely cleaned of mortar, loose rust, form release compounds, dirt, or any other substance which would interfere with proper bonding with concrete. Protective coatings on embedded aluminum items shall continuously cover the surface to be in contact with concrete. Any defects in the coating shall be repaired.

E. Do not place concrete until flow of water entering space to be filled with concrete has been properly stopped or has been diverted by pipes, or other means, and carried out of the forms, clear of the Work. Do not deposit concrete underwater, and do not allow water to rise on concrete surfaces until concrete has attained its initial set. Do not allow water to flow over concrete surface in manner and or velocity that will injure concrete surface finish. Provide temporary pumping or other dewatering operations for removing water as required.

F. Prepare joint surfaces in accordance with Section 03 15 00, Concrete Accessories.

G. Installation of Vapor Retarder:
   1. Provide vapor retarder under slabs-on-grade and outside walls to receive resilient floor finishes, carpet, ceramic and slate tile, chemical resistant coatings, and where shown or indicated on the Drawings.
   2. Install in accordance with manufacturer's instructions, ASTM E1643, and the following:
      a. Unroll vapor retarder with longest dimension parallel with direction of the pour.
      b. Lap vapor retarder over footings and seal to foundation walls.
      c. Overlap vapor retarder joints by six inches and seal with vapor retarder manufacturer's tape.
      d. Seal penetrations, including pipes, in accordance with vapor retarder manufacturer's instructions.
      e. Penetration of vapor retarder is not allowed except for reinforcing steel and permanent utilities.
      f. Repair damaged areas of vapor retarder by providing, for each damaged area, patch of vapor retarder material and overlapping damaged area with the patch by six inches on each side, and securely and continuously taping all four sides of patch to undamaged vapor retarder.

3.5 CONCRETE PLACEMENT

A. General:
   1. Place concrete continuously, so that no concrete will be placed on concrete that has hardened sufficiently to cause formation of seams or planes of weakness within the section. If section cannot be placed continuously, provide construction joints in accordance with Section 03 15 00, Concrete Accessories.
   2. Deposit concrete as nearly as practical in its final location to avoid segregation due to rehandling or flowing. Do not subject concrete to action that may cause segregation.
   3. Screed concrete that is to receive other construction to proper level to avoid excessive skimming or grouting.
   4. Do not use concrete that becomes non-plastic and unworkable, or does not conform to required quality limits, or that has been contaminated by foreign materials. Do not use retempered concrete. Remove rejected concrete from the Site and dispose of it in conformance with Laws and Regulations.
   5. Do not place concrete until forms, bracing, reinforcing, and embedded items are each in final position and secure.
   6. Do not place footings in freezing weather unless adequate precautions are taken against frost action.
   7. Do not place footings, piers or pile caps on frozen soil.
   8. Unless otherwise instructed, place concrete only when ENGINEER is present.
   9. Allow minimum of three days between adjoining concrete placements.

B. Bonding for Next Concrete Pour:
   1. Prepare for bonding of fresh concrete to concrete that has set but is not fully cured, as follows:
      a. Thoroughly wet the surface, but allow no free-standing water.
      b. For horizontal surfaces place a six-inch layer of Construction Joint Grout, as specified in Section 03 60 00, Grouting, over the hardened concrete surface.
      c. Place fresh concrete before the grout has attained its initial set.
   2. Accomplish bonding of fresh concrete to fully cured, hardened, existing concrete by using a bonding agent as specified in Section 03 15 00, Concrete Accessories.

C. Concrete Conveying:
   1. Handle concrete from point of delivery at the Site, transfer to concrete conveying equipment, and transfer to locations of final deposit as rapidly as practical by methods that prevent segregation and loss of concrete mix materials.
   2. Provide mechanical equipment for conveying concrete to ensure continuous flow of concrete at delivery end of conveyor. Provide runways for wheeled concrete conveying equipment from concrete delivery point to locations of final deposit. Keep interior surfaces of conveying equipment, including chutes, free of hardened concrete, debris, water, snow, ice, and other deleterious materials.
   3. Do not use chutes for distributing concrete, unless accepted by ENGINEER.

4. Pumping concrete is allowed, however do not use aluminum pipe for conveying concrete.

D. Placing Concrete into Forms:
1. Deposit concrete in forms in horizontal layers not deeper than 18 inches each and in manner that avoids inclined construction joints. Where placement consists of several layers, place concrete at such rate that concrete being integrated with fresh concrete while still plastic.
2. Do not allow concrete to free-fall within the form from height exceeding four feet. Where high-range water reducer is used to extend slump to at least six inches, maximum allowable free-fall of concrete is six feet. Use "elephant trunks" to prevent free-fall and excessive splashing of concrete on forms and reinforcing. Discontinue free-falls in excess of four feet if there is evidence of segregation.
3. Remove temporary spreaders in forms when concrete placing has reached elevation of such spreaders.
4. Consolidate concrete placed in forms by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidating concrete in accordance with applicable recommended practices in ACI 309. Vibration of forms and reinforcing is not allowed unless otherwise accepted by ENGINEER.
5. Where height of concrete placement in walls exceeds 14 feet, provide temporary windows in formwork to facilitate vibration. Properly close temporary windows when height of concrete approaches windows. Determine location, size, and spacing of temporary windows to suit equipment used.
6. Do not use vibrators to transport concrete inside of forms. Insert and withdraw vibrators vertically at uniformly-spaced locations not farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate the layer of concrete and at least six inches into the preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit the duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcing and other embedded items without causing segregation of concrete mix.
7. Do not place concrete in beam and slab forms until concrete previously placed in columns and walls is no longer plastic.
8. Prevent voids in the concrete. Force concrete under pipes, sleeves, openings, and inserts from one side until visible from the other side.

E. Placing Concrete Slabs:
1. Deposit and consolidate concrete slabs in continuous operation, within limits of construction joints, until placing of a slab panel or section is completed.
2. Consolidate concrete during placing operations using mechanical vibrating equipment, so that concrete is thoroughly worked around reinforcing and other embedded items and into corners.
3. Consolidate concrete placed in beams and girders of supported slabs, and against bulkheads of slabs on ground, as specified in this Article for formed concrete structures.

4. Bring slab surfaces to correct elevation and level. Smooth the surface, leaving surface free of humps or hollows. Do not sprinkle water on surface while concrete is plastic. Do not disturb slab surfaces prior to commencing concrete finishing.
5. Where slabs are placed in conditions of high temperature or wind that could lead to formation of plastic shrinkage cracks, provide evaporation retardant applied in accordance with retardant manufacturer's recommendations, when required by ENGINEER.

F. Quality of Concrete Work:
1. Concrete shall be solid, compact, and smooth, and free of laitance, cracks, and cold joints.
2. Concrete for liquid-retaining structures, and concrete in contact with earth, water, or exposed directly to the elements shall be watertight.
3. Cut out and properly replace to extent directed by ENGINEER, or repair to satisfaction of ENGINEER, surfaces with cracks or voids, that are unduly rough, or are defective in any other way. Thin patches or plastering are unacceptable.
4. Leaks through concrete that exhibit flowing water, and cracks, holes, or other defective concrete in areas of potential leakage, shall be repaired and made watertight.
5. Repair, removal, and replacement of defective concrete as directed by ENGINEER shall be at no additional cost to DEPARTMENT.

G. Cold Weather Placing:
1. Protect concrete Work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures, in compliance with ACI 306 and the Contract Documents.
2. When air temperature has fallen to or may be expected to fall below 40 degrees F, provide adequate means to maintain temperature in area where concrete is being placed between 50 degrees F and 70 degrees F for at least seven days after placing. Provide temporary housings or coverings including tarpaulins or plastic film. Maintain temporary heating and protection as necessary so that ambient temperature does not fall more than 30 degrees F in the 24 hours following the seven-day period. Avoid rapid dry-out of concrete due to overheating, and avoid thermal shock due to sudden cooling or heating.
3. When air temperature has fallen to or is expected to fall below 40 degrees F, uniformly heat water and aggregates before mixing for concrete as required to obtain concrete mixture temperature not less than 55 degrees F and not more than 85 degrees F at point of placement.
4. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials. Before placing concrete, verify that forms, reinforcing, and adjacent concrete surfaces are entirely free of frost, snow, and ice.
5. Do not use salt or other materials containing antifreeze agents. Do not use chemical accelerators or set-control admixtures unless approved by ENGINEER and tested in mix design proposed for use.

H. Hot Weather Placing:
   1. When hot weather conditions exist that would impair the quality and strength of concrete, place concrete in compliance with ACI 305 and the Contract Documents.
   2. When ambient air temperature is at or above 90 degrees F and rising, cool ingredients before mixing concrete to maintain concrete temperature at time of placement below 80 degrees F. When ambient air temperature is at or above 90 degrees F and falling, cool the ingredients before mixing concrete to maintain concrete temperature at time of placement below 85 degrees F. In no case shall the concrete temperature at time of placement exceed 90 degrees F.
   3. Mixing water may be chilled, or chopped ice may be used to control concrete temperature provided the water equivalent of ice is calculated in total amount of mixing water. If required, reduce the time from addition of mix water to placement, or use set-retarding admixture.
   4. Cover reinforcing materials with water-soaked burlap if ambient air temperature becomes too hot, so that reinforcing material temperature does not exceed ambient air temperature immediately before embedment of reinforcing in concrete.
   5. Wet forms thoroughly before placing concrete.
   6. Do not place concrete at temperature that causes difficulty from loss of slump, flash set, or cold joints.
   7. Do not use set-control admixtures unless approved by ENGINEER in mix design.
   8. Obtain ENGINEER's approval of substitute methods and materials proposed for use.

3.6 FINISHING OF FORMED SURFACES

A. Standard Form Finish:
   1. Standard form finish shall be basically smooth and even, but is allowed to have texture imparted by the form material used. Repair defects in accordance with the Contract Documents.
   2. Use standard form finish for the following:
      a. Exterior vertical surfaces from foundation up to one foot below grade.
      b. Vertical surfaces not exposed to view.
      c. Other areas shown or indicated.

B. Smooth Form Finish:
   1. Produce smooth form finish by selecting form materials that will impart smooth, hard, uniform texture. Arrange panels in orderly and symmetrical manner with minimum of seams. Repair and patch defective areas in accordance with the Contract Documents.
   2. Use smooth form finish for the following:
      a. Exterior surfaces exposed to view.
      b. Surfaces to be covered with coating material. Coating material may be applied directly to concrete or may be a covering bonded to concrete such as waterproofing, dampproofing, painting, or other similar system.
      c. Interior vertical surfaces of liquid-containers.

d. Interior and exterior exposed beams and undersides of slabs.
e. Surfaces to receive abrasive blasted finish.
f. Surfaces to receive smooth rubbed or grout cleaned finish.
g. Other areas shown or indicated.

C. Smooth Rubbed Finish:
1. Provide smooth rubbed finish to concrete surfaces that have received smooth form finish and where defects have been repaired, as follows:
a. Rubbing of concrete surfaces not later than the day after form removal.
b. Moistening of concrete surfaces and rubbing with carborundum brick or other abrasive until uniform color and texture is produced. Do not apply cement grout other than that created by the rubbing process.
2. Use smooth rubbed finish for the following:
a. Interior exposed walls and other vertical surfaces.
b. Exterior exposed walls and other vertical surfaces down to one foot below grade.
c. Interior and exterior horizontal surfaces, except exterior exposed slabs and steps.
d. Interior exposed vertical surfaces of liquid-containing structures down to one foot below normal operating liquid level.
e. Other areas shown or indicated.

D. Grout Cleaned Finish:
1. Provide grout cleaned finish to concrete surfaces that have received smooth form finish and where defects have been repaired, as follows:
a. Combine one part portland cement to 1.5 parts fine sand by volume, and mix with water to consistency of thick paint. Blend standard portland cement and white portland cement, in proportions determined by trial patches, so that final color of dry grout will closely match adjacent concrete surfaces.
b. Thoroughly wet concrete surface and apply grout uniformly by brushing or spraying immediately to wetted surfaces. Scrub surface with cork float or stone to coat surface and fill surface holes. Remove excess grout by scraping, followed by rubbing with clean burlap to remove visible grout film. Keep grout damp during setting period by using fog spray on surface for at least 36 hours after final rubbing. Complete each area the same day the area is started, with limits of each area being natural breaks in the finished surface.
2. Use grout cleaned finish for the following:
a. Interior exposed walls and other vertical surfaces.
b. Exterior exposed walls and other vertical surfaces down to one foot below grade.
c. Interior and exterior horizontal surfaces, except exterior exposed slabs and steps.
d. Interior exposed vertical surfaces of liquid-containing structures down to one foot below normal operating liquid level.
e. Other areas shown.

E. Related Unformed Surfaces:
   1. At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike off smooth and finish with texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise shown or indicated.

3.7 SLAB FINISHES

A. Float Finish:
   1. After placing concrete slabs, do not work the surface further until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently. Check and level the surface plane to tolerance not exceeding 1/4-inch in ten feet when tested with a ten-foot straightedge placed on surface at not less than two different angles. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to uniform, smooth, granular texture.
   2. Use float finish for the following:
      a. Interior exposed horizontal surfaces of liquid-containing structures, except those to receive grout topping.
      b. Exterior below-grade horizontal surfaces.
      c. Surfaces to receive additional finishes, except as shown or indicated.

B. Trowel Finish:
   1. After floating, begin first trowel finish operation using power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over the surface.
   2. Consolidate concrete surface by the final hand troweling operation. Finish shall be free of trowel marks, uniform in texture and appearance, and with surface plane tolerance not exceeding 1/8-inch in ten feet when tested with a ten-foot straight edge. Grind smooth surface defects that would otherwise project through applied floor covering system.
   3. Use trowel finish for the following:
      a. Interior exposed slabs, unless otherwise shown or indicated.
      b. Slabs that receive one of the following: resilient flooring, carpeting, or ceramic tile.

C. Non-Slip Broom Finish:
   1. Immediately after float finishing, slightly roughen concrete surface by brooming in direction perpendicular to main traffic route. Use fine fiber-bristle broom, unless otherwise directed by ENGINEER. Coordinate required final finish with ENGINEER before applying finish.
   2. Use non-slip broom finish for the following:
      a. Exterior exposed horizontal surfaces subject to lightweight foot traffic.
      b. Interior and exterior concrete steps and ramps.

D. Special Finish, Troweled Polyester Composition:
   1. For floors receiving troweled polyester composition finish, the following apply:
      a. Provide wood float finish.
      b. Elevation shall be uniform within 1/4-inch tolerance in ten feet.
      c. Use approved curing and hardening compound or proper moist curing procedures.
      d. Cure slabs for 21 days minimum prior to topping.
      e. Protect slabs against oil and greases. Remove from slab surface dripping, flaking, and loose substances and other bonded foreign particles that might prevent adhesion of composition.
      f. Patch and repair other floor imperfections in accordance to finish manufacturer's recommendations.

E. Shake-On Metallic Finish:
   1. For each slab shown or indicated to receive shake-on metallic finish, provide application of shake-on metallic hardener at rate of two pounds per square foot. First shake shall comprise two-thirds of specified quantity of hardener. Provide first application after initial floating operation, unless climatic conditions dictate earlier application. Shake-on metallic hardener shall be floated in the second application. Surface shall be floated again after second application to properly bond hardener to base concrete slab. Surface shall then be troweled at least twice to smooth, dense finish.
   2. Furnish field service upon five days notice by the hardener manufacturer to assist CONTRACTOR in obtaining maximum benefits of product under prevailing conditions at the Site. Hardener manufacturer's representative shall attend concrete coordination conference required in Article 1.3 of this Section.
   3. Use shake-on metallic hardener finish with Class "C" concrete for slabs shown or indicated on the Drawings as receiving this finish.
   4. Protect slabs against oil and greases. Remove from slab surface dripping, flaking, or loose substances and other bonded foreign particles that might prevent adhesion of finish.
   5. Patch and repair other floor imperfections in accordance with hardener manufacturer's recommendations.

F. Scratched Finish:
   1. After providing float finish, roughen concrete surface with rake before concrete's final set. Amplitude of surface shall be minimum of 1/4-inch.
   2. Provide scratched finish for the following:
      a. Horizontal surfaces that will receive grout topping or concrete equipment pad.
      b. Surfaces so indicated on the Drawings or elsewhere in the Contract Documents.

3.8 CONCRETE CURING AND PROTECTION

A. General:
   1. Protect freshly placed concrete from premature drying, excessive cold or hot temperatures, and maintain without drying at relatively constant temperature for period necessary for hydration of cement and proper hardening of concrete.
   2. Start curing after placing and finishing concrete, as soon as free moisture has disappeared from concrete surface. Keep surface continuously moist during entire curing period. Cure for a minimum of 10 days and in accordance with ACI 301 procedures. For concrete sections over 30 inches thick, the curing period shall be for a minimum of 14 days. Avoid rapid drying at end of final curing period.
   3. For curing, use water that is free of impurities that could etch or discolor exposed concrete surfaces.
   4. Confine water for curing to area being cured.

B. Curing Methods: Curing methods are specified below. Curing methods to be used on each type of concrete surface are specified elsewhere in this Article.
   1. Water Curing. Cure by one of the following methods:
      a. Keep concrete surface continuously wet.
      b. Ponding or immersion.
      c. Continuous water-fog spray.
      d. Covering concrete surface with curing mats, thoroughly saturating mats with water, and keeping mats continuously wet with sprinklers or porous hoses. Place curing mats to cover concrete surfaces and edges with four-inch horizontal lap over adjacent mats; provide eight-inch lap over adjacent mats at vertical surfaces. If necessary, weigh down curing cover to maintain contact with concrete surface.
   2. Form Curing. Cure by one of the following methods:
      a. Forms shall be maintained and loosened during curing period.
      b. Immediately after forms are loosened or removed, continue with the required curing method as applicable, for remainder of curing period.
      c. Where wood forms are kept in place, apply water to keep forms wet.
   3. Moisture Retaining Cover Curing. Cure as follows:
      a. Cover concrete surfaces with the required moisture retaining cover for curing concrete, placed in widest practical width with sides and ends lapped at least three inches and sealed using waterproof tape or adhesive. Immediately repair holes or tears during curing period using cover material and waterproof tape.
   4. Liquid Compound Curing. Cure as follows:
      a. Unless otherwise approved by ENGINEER, provide water curing or form curing. Request to use liquid curing compound will be considered by ENGINEER on case-by-case basis. Construction joints, formed surfaces prior to receiving specified form finish, and concrete to receive surface treatment where surface treatment will be bonded to concrete surface (such as, but not limited to grout fill, hardener, coatings, lining, water repellent, painting, resilient flooring, terrazzo flooring, ceramic tile,

quarry tile, chemical resistant coatings, or other applications) shall be water-cured or form-cured.

b. In liquid-retaining structures, provide water curing or form curing, unless other curing method is approved by ENGINEER. Requests to use liquid curing compound will be considered by ENGINEER on case-by-case basis. Request shall provide valid construction reason or safety reason for using liquid compound curing including reason why other curing methods are not viable.

c. Apply curing compounds immediately after final finishing or after terminating water curing. Apply curing compound in continuous operation by power spray equipment in accordance with curing compound manufacturer's directions. If areas are subjected to rainfall within three hours after completing curing compound application, area shall be recoated. Maintain coating continuity and repair areas damaged during curing period.

d. When liquid curing compound is used, apply first coat of liquid curing compound at compound manufacturer's recommended coverage rate, and subsequently apply second coat at identical rate, thus providing twice the curing compound manufacturer's recommended coverage.

e. At end of curing period, remove liquid curing compound where required.

C. Formed Surfaces: Use the following curing methods:

1. Walls That Will Retain Liquid or That are Under Ground Surface:

a. If forms are wood, form curing is allowed for entire curing period. If forms are steel, form curing is allowed for maximum of three days after which forms shall be removed so that concrete is free of the forms for remainder of the curing process.

b. Immediately after the forms are loosened or removed, continue with water curing for remainder of curing period.

c. When wall surface will not receive surface treatment and when allowed by ENGINEER, use of liquid curing compound is allowed. Before using liquid compound curing, use water curing or form curing for at least the first three days of curing.

2. Formed Slab Underside and Beam Surfaces Where Will Retain Liquid:

a. Form curing is allowed for the full curing period.

b. Immediately after forms are loosened or removed, continue with water curing for remainder of curing period.

c. When slab surface will not receive surface treatment and when allowed by ENGINEER, use of liquid curing compound is allowed.

3. Vertical Joint Surfaces and Surfaces to Receive Surface Treatment:

a. Form curing is allowed for entire curing period.

b. Immediately after forms are loosened or removed, continue with water curing for remainder of curing period.

4. Cure other formed surfaces using an appropriate curing method specified in the Contract Documents.

D. Unformed Surfaces: Treat with one of the following curing methods:

1. Slabs and Mats That Will Retain Liquid or are Below Ground Surface:

a. Water curing.
b. Moisture-retaining cover curing when allowed by ENGINEER.
c. When slab or mat surface will not receive surface treatment and when allowed by ENGINEER, use of liquid curing compound is allowed. Before using liquid compound curing, use water curing or form curing for at least the first three days of curing.

2. Construction Joint Surfaces and Slab and Mat Surfaces to Receive Surface Treatment.
   a. Water curing.
   b. Moisture-retaining cover curing.
3. Cure other formed surfaces using an appropriate curing method specified in the Contract Documents.

E. Temperature of Concrete During Curing:
1. When ambient temperature is 40 degrees F or less, continuously maintain concrete temperature between 50 degrees F and 70 degrees F throughout curing period. When necessary, before concrete placing provide for temporary heating, covering, insulation, or housing as required to continuously maintain specified temperatures and moisture conditions throughout concrete curing period. Provide cold weather protection in accordance with ACI 306.
2. When the ambient temperature is 80 degrees F and above, or during other climatic conditions that would cause too-rapid drying of concrete, before starting concrete placing, provide wind breaks and shading as required, and fog spraying, wet sprinkling, or moisture retaining coverings as required. Continuously protect concrete throughout concrete curing period. Provide hot weather protection in accordance with ACI 305, unless otherwise specified.
3. Maintain concrete temperature as uniformly as possible, and protect from rapid ambient temperature changes. Avoid concrete temperature changes that exceed five degrees F in one hour and 50 degrees F in 24-hour period.

F. Protection:
1. During curing period, protect concrete from damaging mechanical disturbances including load stresses, heavy shock, excessive vibration, and damage by rain and flowing water. Protect finished concrete surfaces from damage by subsequent construction operations.

3.9 CONCRETE INSTALLATION TOLERANCES

A. Installation Tolerances:
1. Concrete placement tolerances, unless otherwise specified in the Contract Documents, shall be in accordance with ACI 117.
2. Notify ENGINEER in writing when concrete placement does not conform with required tolerances, as soon as the condition is known to CONTRACTOR.
3. When concrete installation does not conform to required tolerances, do not repair or correct by grinding unless specified in the Contract Documents or approved by ENGINEER in writing.
4. Verification Measurements:

a. If surfaces where tolerances are in question, obtain measurements to verify conformance with tolerances in manner acceptable to ENGINEER.
b. If surfaces tolerances are in question, cost of obtaining measurements shall be at no additional cost to the DEPARTMENT.
c. Before obtaining measurements, obtain ENGINEER's acceptance of method proposed for obtaining measurements.
d. After obtaining measurements, submit measurements to ENGINEER.

5. Submit with verification measurements submittal proposed method to rectify out-of-tolerance concrete. Do not start repair Work without obtaining ENGINEER'S approval.

3.10 FIELD QUALITY CONTROL

A. Field Testing Services:
1. CONTRACTOR shall employ an independent testing laboratory to perform field quality control testing for concrete. ENGINEER will direct where samples are to be obtained.
2. Testing laboratory shall make standard compression test cylinders and entrained air tests as specified in this Article, under direct observation by ENGINEER or Resident Project Representative.
3. Testing laboratory will provide all labor, material, and equipment required for sampling and testing concrete, including: scale, glass tray, cones, rods, molds, air tester, thermometer, and other incidentals required.
4. Provide all curing and necessary cylinder storage as specified.
5. Refer to Article 1.3 of this Section for required testing laboratory qualifications.

B. Quality Control Testing During Construction:
1. Perform sampling and testing for field quality control during placement of concrete, as follows:
a. Sampling Fresh Concrete: ASTM C172.
b. Slump: ASTM C143; one test for each concrete load at point of discharge.
c. Concrete Temperature: ASTM C1064; one for every two concrete loads at point of discharge, and when a change in the concrete is observed. Test each load when time from batching to placement exceeds 75 minutes.
d. Air Content: ASTM C231; one for every two concrete load at point of discharge, and when a change in the concrete is observed.
e. Unit Weight: ASTM C138; one for every two concrete loads at point of discharge, and when a change in the concrete is observed.
f. Compression Test Specimens:
1) In accordance with ASTM C31; make one set of compression cylinders for each 50 cubic yards of concrete, or fraction thereof, of each mix design placed each day. Each set shall be four standard cylinders, unless otherwise directed by ENGINEER.
2) Cast, store, and cure specimens in accordance with ASTM C31.

3) Test and record the following when cylinders are cast: slump, concrete temperature, air content, and unit weight.

g. Compressive Strength Tests:

1) In accordance with ASTM C39; one specimen tested at seven days, and three specimens tested at 28 days.

2) Adjust mix design if test results are unsatisfactory and resubmit for approval.

3) Concrete that does not comply with strength requirements will be considered as defective Work.

h. Water/Cementitious Materials Ratio: Perform test when required by ENGINEER in accordance with AASHTO TP23.

h. Water/Cementitious Materials Ratio: Perform one test from each sample from which compression test specimens are taken, in accordance with AASHTO TP23.

i. Within 24 hours of completion of test, testing laboratory will submit certified copy of test results to CONTRACTOR and ENGINEER.

i. Submit test results, certified by testing laboratory, to ENGINEER within 24 hours of completion of test.

C. Evaluation of Field Quality Control Tests:

1. Do not use concrete delivered to final point of placement having slump, concrete temperature, total air content or unit weight outside specified values.

2. Water/Cementitious Materials Ratio:

a. When water content testing indicates water/cementitious materials ratio to exceed specified requirements by greater than 0.02, remaining batches required to complete concrete placement shall have water content decreased in the mix and water reducing admixture dosage increased as required to bring subsequently-batched concrete within specified water/cementitious materials ratio.

b. Perform additional testing to verify compliance with specified water/cementitious materials ratio.

c. Do not resume concrete production for further concrete placement until CONTRACTOR has identified cause of excess water in the mix and revised batching procedures, or adjusted the mix design (and obtained ENGINEER's associated approval) to bring water/cementitious materials ratio into conformance with the Contract Documents.

3. Compressive Strength:

a. Compressive strength tests for laboratory-cured cylinders will be acceptable if the averages of all sets of three consecutive compressive strength tests results equal or exceed specified 28-day design compressive strength of the associated type or class of concrete, and no individual strength test falls below required compressive strength by more than 500 psi.

b. Questionable Field Conditions During Concrete Placement:

1) Where questionable field conditions exist during concrete placement or immediately thereafter, strength tests of specimens cured under field conditions will be required by ENGINEER to check adequacy of curing and protecting of concrete placed. Specimens shall be molded

at the same time and from the same samples as laboratory-cured specimens.

2) Provide improved means and procedures for protecting concrete when 28-day compressive strength of field-cured cylinders is less than 85 percent of companion laboratory cured cylinders.

3) When laboratory-cured cylinder strengths are appreciably higher than minimum required compressive strength, field-cured cylinder strengths need not exceed minimum required compressive strength by greater than 500 psi even though the 85 percent criterion may not be met.

4) If individual tests of laboratory-cured specimens produce strengths more than 500 psi below the required minimum compressive strength, or if tests of field-cured cylinders indicate deficiencies in protection and curing, provide additional measures to ensure that load-bearing capacity of the structure is not jeopardized or impaired. If likelihood of low-strength concrete is confirmed and evaluations indicate load-bearing capacity may have been reduced, perform tests of cores from the concrete in question at CONTRACTOR's expense.

c. If compressive strength tests fail to indicate compliance with minimum requirements of the Contract Documents, concrete represented by such tests will be considered defective.

D. Testing Concrete Structure for Strength:

1. When there is evidence that strength of in-place concrete does not comply with the Contract Documents, CONTRACTOR shall employ the services of concrete testing laboratory to obtain cores from hardened concrete for compressive strength determination. Cores and tests shall comply with ASTM C42 and the following:

   a. Obtain at least three representative cores from each concrete member or suspect area of concrete at locations directed by ENGINEER.

   b. Strength of concrete for each series of cores will be acceptable if average compressive strength is at least 85 percent of specified compressive strength and no single core is less than 75 percent of required 28-day required concrete compressive strength.

   c. Testing laboratory shall submit test results to ENGINEER on same day that tests are completed. Include in test reports Project name and number (if any), date of sampling and testing, CONTRACTOR name, name of concrete testing laboratory, exact location of test core in the Work, type or class of concrete represented by core sample, nominal maximum size aggregate, design compressive strength, compression breaking strength, and type of break (corrected for length-diameter ratio), direction of applied load to core with respect to horizontal plane of concrete as placed, and moisture condition of the core at time of testing.

2. Fill core holes solid with non-shrink grout in accordance with Section 03 60 00, Grouting, and finish to match adjacent concrete surfaces.

3. If results of core tests are unacceptable or if it is impractical to obtain cores, perform static load test and evaluations complying with ACI 318 and ACI 350, as directed by ENGINEER.

E. Concrete Tolerance Verification Measurements: Refer to Article 3.9 of this Section.

F. Supplier's Services:
   1. Water-Reducing Admixture Manufacturer: Furnish services of qualified concrete technician employed by admixture manufacturer to assist in proportioning concrete for optimum use of admixture. Concrete technician shall advise on proper addition of admixture to concrete and on adjustment of concrete mix proportions to meet changing conditions at the Site.

3.11 MISCELLANEOUS CONCRETE ITEMS

A. Temporary Openings:
   1. Openings in concrete walls and slabs required for passage of Work are allowed only upon approval of ENGINEER.
   2. Temporary openings made in concrete shall be provided with waterstop in below-ground or liquid-retaining members and structures. Reinforcement going through and around the opening shall be made continuous to provide continuity and shall be approved by the ENGINEER.
   3. Temporary openings that remain in concrete structures shall be filled with the same class of concrete as the adjoining construction, after the Work causing need for temporary opening is complete, unless otherwise shown or directed by ENGINEER. Mix, place, and cure concrete as specified in this Section to blend with in-place construction. Provide miscellaneous concrete filling shown or required to complete the Work.

B. Bases or Pads for Piping, Panels, and Equipment:
   1. Unless specifically shown or indicated otherwise, provide concrete bases or pads for equipment, floor-mounted panels, and floor-mounted supports for piping and similar construction. Provide all concrete pad and base Work not specifically included under other Sections (or other contracts).
   2. Dimensions and Elevations:
      a. Coordinate and construct bases and pads to dimensions shown or indicated, or as required to comply with equipment, panel, or piping manufacturer's requirements and elevations indicated on the Drawing.
      b. Unless otherwise shown or indicated, place concrete bases for equipment up to one-inch below the equipment manufacturer's base or mounting plate.
      c. Where specific dimensions or elevations are not shown or indicated, bases and pads shall be six inches thick and extend three inches outside dimensions of the equipment, panel, or supports.
   3. Finish: Bases and pads outside of areas to receive non-shrink grout shall have smooth trowel finish, unless special finish such as terrazzo, ceramic tile, quarry tile, or heavy-duty concrete topping is required. In such cases, provide appropriate concrete finish. Surfaces of bases and pads to receive non-shrink grout shall have broom finish.

C. Curbs:
   1. Provide monolithic finish to interior curbs by stripping forms while concrete is still green followed by steel-troweling surfaces to hard, dense finish with corners, intersections, and terminations slightly rounded.
   2. Exterior curbs shall have rubbed finish for vertical surfaces and broomed finish for top surfaces.

D. Steel Pan Stairs:
   1. Provide concrete fill for steel pan stair treads, landings, and associated items. Screed, tamp, and finish concrete surfaces as shown or indicated.
      a. Cast into the concrete fill safety inserts and accessories as shown or indicated.

3.12 REPAIR OF CONCRETE PLACED UNDER THIS CONTRACT

A. Repair of Formed Surfaces:
   1. Repair the following defects in all formed finishes:
      a. Spalls, air bubbles, rock pockets, form depressions, and other defects that are more than 1/4-inch in depth.
      b. Holes from tie rods and other form tie systems.
      c. Fins, offsets, and other projections that extend more than 1/4-inch beyond designated concrete member surface.
      d. Structural cracks, as defined by ENGINEER.
      e. Non-structural cracks greater than 0.010-inch wide as defined by ENGINEER. In liquid-retaining structures, elevated slabs subject to the elements or washdowns, below-grade members, and cracks that evidence leakage. Where it is not possible to verify whether a crack is leaking, repair the crack.
   2. Repair the following defects in smooth-finish surfaces, in addition to those listed above in this Section:
      a. Spalls, air bubbles, rock pockets, form depressions, and other defects that extend to more than 1/2-inch in width in any direction, no matter how deep.
      b. Spalls, air bubbles, rock pockets, form depressions, and other defects of any size that exceed three in number in a 12-inch by 12-inch area, or 12 in number in a three-foot by three-foot area.
      c. Fins, offsets, and other projections shall be completely removed and smoothed.
      d. Scratches and gouges in concrete surface.
      e. Texture and color irregularities. In liquid-retaining surfaces, texture and color irregularities need not be repaired when greater than 12 inches below minimum normal operating liquid surface elevation, except where such defects are indicative of reduced durability.
   3. Where smooth rubbed or grout cleaned finish is specified, minor surface defects repairable by the finishing process need not be repaired prior to finish application, when approved by ENGINEER.

B. Method of Repair of Formed Surfaces:
   1. Immediately after removing forms, repair and patch defective areas with cement mortar or concrete repair mortar as directed by ENGINEER. Make repairs made to liquid-retaining structures and below-grade surfaces with repair mortar only. Repair form tie holes in liquid-retaining or below-grade surfaces with non-shrink grout in accordance with Section 03 60 00, Grouting.
   2. Honeycombs, Rock Pockets, and Holes Left by Tie Rods and Bolts:
      a. Cut out honeycomb, rock pockets, voids, and holes left by tie rods and bolts, down to solid concrete but, in no case, to depth less than one-inch for cement mortar and 1/2-inch for repair mortar. Make edges of cuts perpendicular to concrete surface.
      b. Before placing cement mortar, thoroughly clean and brush-coat area to be patched with specified bonding agent.
      c. When using concrete repair mortar, use of bonding agent is optional; prepare the surface and place mortar in accordance with mortar manufacturer's recommendations.
      d. Repairs at exposed-to-view surfaces shall match the color of surrounding concrete, except color matching is not required for interior surfaces of liquid-retaining surfaces up to one foot below typical minimum liquid level. Impart texture to repaired surfaces to match texture of existing adjacent surfaces. Provide test areas at inconspicuous locations to verify mixture, texture, and color match before proceeding with patching.
      e. Compact mortar in place and strike off slightly higher than the surrounding surface.
   3. Structural Cracks: Pressure-grout structural cracks using injectable epoxy installed using pressurized system. Apply in accordance with epoxy manufacturer's directions and recommendations.
   4. Non-structural Cracks: Shall be pressure-grouted using hydrophobic or hydrophilic resin. Install in accordance with resin manufacturer's directions and recommendations.
   5. Determination of the crack type shall be made by the ENGINEER.
   6. Holes Through Concrete:
      a. Using plunger-type gun or other suitable device, fill holes extending through concrete from least-exposed face, using flush stop held at exposed face; completely fill the hole with specified repair material.
      b. At below-grade and liquid-containing members, fill holes with concrete repair mortar and use color-matched cement mortar for outer two inches at exposed-to-view surfaces.
   7. Where powerwashing or scrubbing is not adequate, abrasive blast exposed-to-view surfaces that require removal of stains, grout accumulations, sealing compounds, and other substances marring the surfaces. Use sand finer than No. 30 and air pressure from 15 to 25 psi.

C. Repair of Unformed Surfaces:
   1. Test unformed surfaces, such as monolithic slabs, for smoothness and to verify surface plane to specified tolerances for each surface and finish. Correct low and high areas in accordance with this Section.

2. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using template having the required slope. Correct high and low areas in accordance with this Section.
3. Repair finish of unformed surfaces containing defects that adversely affect concrete durability. Surface defects include crazing, cracks in excess of 0.01-inch wide, spalling, popouts, honeycombs, rock pockets, and other objectionable conditions.
4. Repair structural cracks in all structures and non-structural cracks in liquid-retaining structures. In liquid-retaining structures, where dry face of concrete member can be observed, repair all cracks evidencing any rate of water flow through crack. Where dry face of member cannot be observed, repair all cracks.

D. Methods of Repair of Unformed Surfaces:
1. Correct high areas in unformed surfaces by grinding, after concrete has cured sufficiently so that repairs can be made without damage to adjacent areas.
2. Correct low areas in unformed surfaces, during or immediately after completion of surface finishing, by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Where repairs are required and concrete has already set, sawcut around perimeter of area to be repaired to depth of 1/2-inch and remove concrete so that minimum thickness of repair is 1/2-inch. Apply specified concrete repair mortar in accordance with repair mortar manufacturer's directions and recommendations.
3. Repair defective areas, except random cracks and single holes not exceeding one-inch diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts, and expose reinforcing steel with at least 3/4-inch clearance all around. Minimum thickness of repair shall be 1.5 inches. Dampen concrete surfaces in contact with patching concrete and brush with specified bonding agent. Place patching concrete while bonding agent is tacky. Mix patching concrete of same materials and proportions to provide concrete of same classification as original, adjacent concrete. Place, compact, and finish as required to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete.
4. Repair isolated, random, non-structural cracks (in members that are not below grade or liquid-retaining), and single holes not greater than one-inch diameter, by dry-pack method. Groove top of cracks, and cut out holes to sound concrete, and clean repair area of dust, dirt, and loose particles. Dampen all cleaned concrete surfaces and brush with the specified bonding agent. Place dry-pack before cement grout takes its initial set. Mix dry-pack, consisting of one part portland cement to 2.5 parts fine aggregate passing No. 16 mesh sieve, using only enough water as required for handling and placing. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched areas continuously moist for at least 72 hours.
5. Structural cracks shall be pressure-grouted using injectable epoxy. Apply in accordance with epoxy manufacturer's directions and recommendations.

6. Non-structural cracks in below-grade and liquid-retaining structures shall be pressure-grouted using hydrophilic resin. Apply in accordance with resin manufacturer's directions and recommendations.
7. Determination of crack type will be by ENGINEER.
8. Ensure that surface is acceptable for flooring material to be installed in accordance with flooring manufacturer's recommendations.

E. Other Methods of Repair:
1. Repair methods not specified in this Section may be used when approved by ENGINEER.

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SECTION 03 60 00

GROUTING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install grout and perform grouting Work.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before grouting Work.

C. Related Sections:
   1. Section 03 15 00, Concrete Accessories.
   2. Section 03 30 00, Cast-In-Place Concrete.

D. Application and Grout Material:
   1. The following is a listing of grouting applications and the corresponding type of grout material to be provided for the associated application. Unless shown or indicated otherwise in the Contract Documents, provide grout in accordance with the following:

TABLE 03 60 00-A, GROUT APPLICATIONS AND MATERIAL TYPES

Application	Required Grout Material Type
Beam and column (one- or two-story height) base plates and precast concrete bearing less than 16 inches in the least dimension	Class II Non-Shrink
Column base plates and precast concrete bearing (greater than two-story height or larger than 16 inches in the least dimension)	Class I Non-Shrink
Base plates for storage tanks and other non-motorized equipment, and motorized equipment or machinery less than 50 horsepower	Class I Non-Shrink (unless otherwise recommended by equipment manufacturer)
Motorized equipment or machinery equal to and greater than 50 horsepower, and motorized equipment or machinery equipment less than 50 horsepower subject to severe shock loads or high vibration	Class III Non-Shrink Epoxy (unless otherwise recommended by equipment manufacturer)

Filling blockout spaces for embedded items such as railing posts, guide frames for hydraulic gates, and similar applications	Class II Non-Shrink (Class I where placement time exceeds 15 minutes)
Grout fill or grout toppings less than four inches thick	Grout Fill
Grout fill greater than four inches thick	Class "B" Concrete in accordance with Section 03 30 00, Cast-In-Place Concrete
Grout for setting filter underdrain blocks, and for filling voids between filter underdrain blocks, and for filling voics between filter underdrain blocks and walls	Filter Underdrain Blocks Grout
Applications not listed above, where grout is indicated on the Drawings	Class I Non-Shrink, unless shown or indicated otherwise

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ACI 211.1, Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
   2. ACI 301, Structural Concrete for Buildings.
   3. ASTM C33/C33M, Specification for Concrete Aggregates.
   4. ASTM C109/C109M, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).
   5. ASTM C230/C230M, Specification for Flow Table for Use in Tests of Hydraulic Cement.
   6. ASTM C531, Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
   7. ASTM C579, Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
   8. ASTM C827, Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.
   9. ASTM C882/C882M, Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete By Slant Shear.
   10. ASTM C939, Text Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method).
   11. ASTM C1107/C1107M, Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
   12. ASTM C1181, Test Methods for Compressive Creep of Chemical-Resistant Polymer Machinery Grouts.
   13. NSF/ANSI 61, Drinking Water System Components - Health Effects.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Grout Testing Laboratory:

a. Independent testing laboratory employed for design and testing of grout materials and mixes shall comply with testing laboratory requirements in Section 03 30 00, Cast-in-Place Concrete and other applicable requirements in the Contract Documents.

2. Manufacturer: Shall have a minimum of five years experience of producing products substantially similar to that required and shall be able to submit documentation of at least five satisfactory installations that have been in successful operation for at least five years each.

3. Manufacturer's Field Service Technician: When required, provide services of manufacturer's full-time employee, factory-trained in handling, use, and installing the products required, with at least five years of experience in field applications of the products required.

B. Trial Batch:

1. Each grout fill and construction joint grout mix proportion and design shall be verified by laboratory trial batch or field experience methods. Comply with ACI 211.1 and submit to ENGINEER a report with the following data:

a. Complete identification of aggregate source of supply.

b. Tests of aggregates for compliance with specified requirements.

c. Scale weight of each aggregate.

d. Absorbed water in each aggregate.

e. Brand, type, and composition of cement.

f. Brand, type, and amount of each admixture.

g. Amounts of water used in trial mixes.

h. Proportions of each material per cubic yard.

i. Unit weight and yield per cubic yard of trial mixtures.

j. Measured slump.

k. Measured air content.

l. Compressive strength developed at seven days and 28 days, from not less than three test specimens cast for each seven-day and 28-day test, and for each design mix.

2. Laboratory Trial Batches: When laboratory trial batches are used to select grout proportions, prepare test specimens and conduct strength tests as specified in ACI 301.

3. Field Experience Method: When field experience methods are used to select grout proportions, establish proportions as specified in ACI 301.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:

1. Shop Drawings:

a. Schedule of Project-specific grout applications, installation locations, and the grout type proposed for each.

b. List of grout materials and proportions for the proposed mix designs. Include data sheets, test results, certifications, and mill reports to qualify the materials proposed for use in the mix designs. Do not start laboratory trial batch testing until submittal is approved by ENGINEER.

c. Trial Batch Reports: Submit laboratory test reports for grout materials and mix design tests.

2. Product Data:
   a. Data sheets, certifications, and manufacturer's specifications for all materials proposed for use.

B. Informational Submittals: Submit the following:
   1. Manufacturer's Instructions:
      a. Special instructions for shipping, storing, protecting, and handling.
      b. Installation instructions for the materials.
   2. Field Quality Control Submittals:
      a. Report field testing results for each required time period. (e.g., seven-day tests, 28-day tests). Submit within 24 hours after completion of associated test. Each test report shall include results of all testing required at time of sampling.
   3. Supplier Reports:
      a. Submit written report of results of each visit to Site by Supplier's field service technician, including purpose and time of visit, tasks performed, and results obtained. Submit within two days of completion of visit to the Site.
   4. Qualifications Statements:
      a. Testing laboratory, when not submitted under other Sections.
      b. Manufacturer, when submittal of qualifications is required by ENGINEER.
      c. Manufacturer's field service technician, when submittal of qualifications is required by ENGINEER.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Storage of Materials: Store grout materials in a dry location, protected from weather and protected from moisture.

PART 2 – PRODUCTS

2.1 NON-SHRINK GROUT MATERIALS

A. General: Non-shrink grout shall be a prepackaged, inorganic, flowable, non-gas-liberating, non-metallic, cement-based grout requiring only the addition of water. Manufacturer's instructions shall be printed on each bag or container in which the materials are packaged. Specific formulation for each type or class of non-shrink grout specified in this Section shall be that recommended by the grout manufacturer for the particular application.

B. Class I Non-Shrink Grout:
   1. Class I non-shrink grouts shall have a minimum 28-day compressive strength of 7,000 psi. Use grout for precision grouting and where water-tightness and

non-shrink reliability in both plastic and hardened states is critical, in accordance with Table 03 60 00-A in this Section.

2. Products and Manufacturer: Provide one of the following:
   a. Masterflow 928, by Master Builders, Inc.
   b. Five Star Grout, by Five Star Products, Inc.
   c. Hi-Flow Grout, by Euclid Chemical Company.
   d. Or equal.
3. Comply with ASTM C1107/C1107M, Grade C and B (as modified below) when tested using amount of water required to achieve the following properties:
   a. Fluid consistency (20 to 30 seconds) shall be in accordance with ASTM C939.
   b. At temperatures of 45, 73.4, and 95 degrees F.
4. Length change from placing to time of final set shall not have shrinkage greater than the expansion measured at three or fourteen days. Expansion at three or fourteen days shall not exceed the 28-day expansion.
5. Non-shrink property shall not be based on chemically-generated gas or gypsum expansion.
6. Fluid grout shall pass through the flow cone, with continuous flow, one hour after mixing.

C. Class II Non-Shrink Grout:
1. Class II non-shrink grouts shall have minimum 28-day compressive strength of 7,000 psi. Use grout for general-purpose grouting applications in accordance with Table 03 60 00-A in this Section.
2. Products and Manufacturer: Provide one of the following:
   a. Construction Grout, by Master Builders, Inc.
   b. FSP Construction Grout, by Five Star Products, Inc.
   c. NS Grout, by Euclid Chemical Company.
   d. Or equal.
3. Comply with ASTM C1107/C1107M and the following when tested using the quantity of water required to achieve the following properties:
   a. Flowable consistency (140 percent flow in accordance with ASTM C230/C230M, five drops in 30 seconds).
   b. Fluid working time of at least 15 minutes.
   c. Flowable for at least 30 minutes.
4. When tested, grout shall not bleed at maximum allowed water.
5. Non-shrink property shall not be based on chemically-generated gas or gypsum expansion.

D. Class III Non-Shrink Epoxy Grout:
1. Epoxy grout shall be a pourable, non-shrink, 100-percent solids system.
2. Products and Manufacturer: Provide one of the following:
   a. E3G, by Euclid Chemical Company.
   b. Sikadur 42 Grout Pak, by Sika Corporation.
   c. HP Epoxy Grout, by Five Star Products, Inc.
   d. Or equal.

3. Epoxy grout system shall have three components: resin, hardener, and specially blended aggregate, all pre-measured and prepackaged. Resin component shall not contain non-reactive diluents. Resins containing butyl glycidyl ether (BGE) or other highly volatile and hazardous reactive diluents are unacceptable. Variation of component ratios is not allowed without specific recommendation by manufacturer. Manufacturer's instructions shall be printed on each container in which products are packaged.
4. The following properties shall be attained with the minimum quantity of aggregate allowed by epoxy grout manufacturer.
    a. Vertical volume change at all times before hardening shall be between zero percent shrinkage and 4.0 percent expansion when measured in accordance with ASTM C827 (modified for epoxy grouts by using an indicator ball with specific gravity between 0.9 and 1.1).
    b. Length change after hardening shall be less than 0.0006-inch per inch and coefficient of thermal expansion shall be less than 0.00003-inch per inch per degree F when tested in accordance with ASTM C531.
    c. Compressive creep at one year shall be less than 0.001-inch per inch when tested under a 400-psi constant load at 140 degrees F in accordance with ASTM C1181.
    d. Minimum seven-day compressive strength shall be 14,000 psi when tested in accordance with ASTM C579
    e. Grout shall be capable of maintaining at least a flowable consistency for minimum of 30 minutes at 70 degrees F.
    f. Shear bond strength to portland cement concrete shall be greater than shear strength of concrete when tested in accordance with ASTM C882/C882M.
    g. Minimum effective bearing area shall be 95 percent.

2.3 GROUT MATERIALS OTHER THAN NON-SHRINK GROUT

A. General: Materials for grouts (other than non-shrink grouts) shall be in accordance with Section 03 30 00, Cast-In-Place Concrete, except as otherwise specified in this Section.

B. Grout Fill:
1. Grout fill shall be comprised of cement, fine aggregate, coarse aggregate, water, and admixtures proportioned and mixed in accordance with this Section.
    a. Minimum Compressive Strength: 4,000 psi at 28 days.
    b. Maximum Water-Cement Ratio: 0.45 by weight.
    c. Coarse Aggregate: ASTM C33/C33M, No. 8 size.
    d. Fine Aggregate: ASTM C33/C33M, approximately 60 percent by weight of total aggregate.
    e. Air Content: Seven percent (plus or minus one percent).
    f. Minimum Cement Content: 564 pounds per cubic yard.
    g. Slump for grout fill shall be adjusted to match placing and finishing conditions, and shall not exceed four inches.

C. Construction Joint Grout:
   1. Construction joint grout shall be comprised of cement, fine aggregate, coarse aggregate, water, and admixtures proportioned with similar cementitious characteristics as Class "A" concrete specified in Section 03 30 00, Cast-In-Place Concrete. Mix design shall result in grout that is flowable with high mortar content. Mix requirements are:
      a. Minimum Compressive Strength: 4,500 psi at 28 days.
      b. Maximum Water-Cement Ratio: 0.42 by weight.
      c. Coarse Aggregate: ASTM C33/C33M, No. 8 size.
      d. Fine Aggregate: ASTM C33/C33M, approximately 60 percent by weight of total aggregate.
      e. Air Content: Seven percent (plus or minus one percent).
      f. Minimum Cement Content: 752 pounds per cubic yard.
      g. Slump for Construction Joint Grout: Seven inches (plus or minute one inch).

D. Filter Underdrain Blocks Grout:
   1. Grout shall comply with Article 2.1 of this Section. Grout shall consist of one part cement to two parts sand with shrinkage-reducing admixture. Class I or Class II non-shrink grout may be used in lieu of filter underdrain blocks grout.
      a. Minimum Compressive Strength: 4,000 psi at 28 days.
      b. Maximum Water-Cement Ratio: 0.45 by weight.

2.4 CURING MATERIALS

A. Curing materials shall comply with Section 03 30 00, Cast-in-Place Concrete, and shall be as recommended by the manufacturer of prepackaged grouts.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine substrate and conditions under which grouting will be performed and notify ENGINEER in writing of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. General:
   1. Place grout as shown and indicated, and in accordance with Laws and Regulations and grout manufacturer's instructions. If manufacturer's instructions conflict with the Contract Documents, obtain clarification or interpretation from ENGINEER before proceeding.
   2. Consistency of non-shrink grouts shall be as required to completely fill the space to be grouted for the particular application. Do not install grout for dry-packing without approval of ENGINEER. When dry-packing is approved by

ENGINEER, dry-pack consistency shall be such that grout has sufficient water to ensure hydration and grout strength development, and remains plastic, moldable, and that does not flow.

3. Grouting shall comply with temperature and weather limitations in Section 03 30 00, Cast-In-Place Concrete.
4. Cure grout in accordance with grout manufacturer's instructions for prepackaged grout and Section 03 30 00, Cast-In-Place Concrete, for grout fill.

B. Columns and Beams:
1. After shimming columns and beams to proper elevation, securely tighten anchors. Properly form around base plates allowing sufficient room around edges for placing grout. Provide adequate depth between bottom of base plate and top of concrete base to assure that void is completely filled with non-shrink grout.

C. Equipment Bases:
1. Install equipment in accordance to manufacturer's recommendations, Laws, and Regulations, and the Contract Documents. After shimming equipment to proper elevation, securely tighten anchors. Properly form around base plates, allowing sufficient room around edges for placing grout. Provide adequate depth between bottom of equipment base and top of concrete base to ensure that voids are completely filled with non-shrink grout.

D. Handrail Posts:
1. After posts have been properly inserted into holes or sleeves, fill annular space between posts and sleeve with non-shrink grout. Bevel grout at juncture with post so that water will flow away from post.

D. Construction Joints:
1. Place a six-inch minimum thick layer of construction joint grout over contact surface of concrete at interface of horizontal construction joints in accordance with Section 03 15 00, Concrete Accessories, and Section 03 30 00, Cast-In-Place Concrete.

E. Grout Fill:
1. All mechanical, electrical, and finish work shall be completed prior to placing grout fill. Base slab shall be provided with a scratched finish in accordance with Section 03 30 00, Cast-In-Place Concrete. Roughen existing slabs shall by abrasive blasting or hydroblasting exposing aggregates to ensure bonding to base slab.
2. Minimum thickness of grout fill shall be one-inch. Where finished surface of grout fill is to form an intersecting angle of less than 45 degrees with concrete surface against which grout will be placed, form a key in the concrete surface at the intersection point. Key shall be minimum of 3.5 inches wide by 1.5 inches deep.
3. Thoroughly clean and wet base slab prior to placing grout fill. Do not place grout fill until slab is completely free of standing water. A thin coat of neat

Type II cement slurry shall be broomed into surface of slab. Place grout fill while slurry is wet. Grout fill shall be compacted by rolling or tamping, brought to elevation, and floated. In tanks and basins where scraping-type equipment will be installed, grout fill shall be screeded by blades attached to revolving mechanism of equipment in accordance with procedures recommended by equipment manufacturer after grout is brought to elevation.

4. Grout fill placed on sloping slabs shall be installed uniformly from bottom of slab to top, for full width of placement.
5. Test grout fill surface with a straight edge to detect high and low spots; immediately correct high and low spots in grout fill. When grout fill has hardened sufficiently, grout fill shall be steel troweled to provide a smooth surface free of bug holes and other imperfections. While an acceptable type of mechanical trowel may be used in this operation, the last pass over the grout fill surface shall be by hand-troweling. During finishing, do not apply the following to the grout fill surface: water, dry cement, or mixture of dry cement and sand.
6. Cure and protect grout fill in accordance with Section 03 30 00, Cast-In-Place Concrete.

3.3 FIELD QUALITY CONTROL

A. Field Testing Services:
   1. CONTRACTOR shall employ an independent testing laboratory to perform field quality control testing for grout. ENGINEER will direct where samples are to be obtained.
   2. CONTRACTOR shall provide all curing and necessary cube storage
   3. Comply with testing laboratory requirements in Section 03 30 00, Cast-In-Place Concrete for required testing laboratory qualifications.

B. Quality Control Testing During Construction:
   1. Grout Fill: Perform sampling and testing for field quality control during grout fill placing as follows:
      a. Sampling Fresh Grout Fill: ASTM C172.
      b. Slump: ASTM C143; one test for each load of grout at point of discharge.
      c. Air Content: ASTM C231; one sample for every two grout loads at point of discharge, and when a change in the grout is observed.
      e. Compression Test Specimens:
         1) In accordance with ASTM C109/C109M; make one set of compression cubes for each 50 cubic yards of grout, or fraction thereof, of each mix design placed each day. Each set shall be four standard cubes, unless otherwise directed by ENGINEER.
   2. Non-shrink Grout: Perform sampling and testing for field quality control during non-shrink grout placing as follows:
      a. Perform compression testing of non-shrink grout in accordance to ASTM C109/C109M at intervals during construction as selected by ENGINEER. Make a set of four specimens for testing compressive strength at a period of time selected by the ENGINEER.

b. Perform compression tests on epoxy grout and fabricate specimens for epoxy grout testing in accordance with ASTM C579, Method B, at intervals during construction as selected by the ENGINEER. Make a set of four specimens for testing compressive strength at a period of time selected by ENGINEER.

C. Evaluation of Field Quality Control Tests:
1. Do not use grout, delivered to final point of placement, having slump or total air content that does not comply with the Contract Documents.
2. Compressive strength tests for laboratory-cured cubes will be acceptable if averages of all sets of three consecutive compressive strength test results equal or exceed the required 28-day design compressive strength of the associated type of grout.
3. If the compressive strength tests do not comply with the requirements in the Contract Documents, the grout represented by such tests will be considered defective and shall be removed and replaced, or subject to other action required by ENGINEER, at CONTRACTOR's expense.

D. Manufacturer's Services:
1. Manufacturers of proprietary materials shall make available upon 72 hours notification the services of qualified, full time employee, experienced in serving as a field service technician for the products required, to aid in assuring proper use of products under the actual conditions at the Site.

+ + END OF SECTION + +

SECTION 05 05 33

ANCHOR SYSTEMS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install anchor systems.
   2. This Section includes all anchor systems required for the Work, but not specified under other Sections.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before anchor systems Work.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ACI 318, Building Code Requirements for Structural Concrete.
   2. ACI 350, Code Requirements for Environmental Engineering Concrete Structures.
   3. ACI 355.2, Qualification of Post-Installed Mechanical Anchors in Concrete.
   4. ANSI B212.15, Cutting Tools - Carbide-tipped Masonry Drills And Blanks For Carbide-tipped Masonry Drills.
   5. ANSI/MSS SP-58, Pipe Hangers and Supports – Materials, Design, Manufacture, Selection, Application, and Installation.
   6. ASTM A194/A194M, Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
   7. ASTM A276, Specification for Stainless Steel Bars and Shapes.
   8. ASTM A493, Specification for Stainless Steel Wire and Wire Rods for Cold Heading and Cold Forging.
   9. ASTM A563, Specification for Carbon and Alloy Steel Nuts.
   10. ASTM A1011/A1011M, Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
   11. ASTM B633, Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
   12. ASTM C307, Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacings.
   13. ASTM C881/C881M, Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
   14. ASTM D695, Test Method for Compressive Properties of Rigid Plastics.

15. ASTM D790, Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
16. ASTM E329, Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
17. ASTM E488, Test Methods for Strength of Anchors in Concrete and Masonry Elements.
18. ASTM F593, Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
19. ASTM F594, Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
20. ASTM F1554, Specification for Anchor Bolts, Steel, 36, 55 and 105-ksi Yield Strength.
21. FS A-A-1922A, Shield, Expansion (Caulking Anchors, Single Lead).
22. FS A-A-1923A, Concrete Expansion Anchors.
23. FS A-A-1925A, Shield, Expansion (Nail Anchors).
24. FS A-A-55614, Shield, Expansion (non-drilling expansion anchors).
25. ICC-ES AC01, Acceptance Criteria for Expansion Anchors in Masonry Elements.
26. ICC-ES AC58, Acceptance Criteria for Adhesive Anchors in Masonry Elements.
27. ICC-ES AC60, Acceptance Criteria for Anchors in Unreinforced Masonry Elements.
28. ICC-ES AC193, Acceptance Criteria for Mechanical Anchors in Concrete Elements.
29. ICC-ES AC308, Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements.
30. ISO 3506-1, Mechanical Properties of Corrosion-Resistant Stainless Steel Fasteners -- Part 1: Bolts, Screws and Studs.
31. NSF/ANSI 61, Drinking Water System Components – Health Effects.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Testing Laboratory: Shall comply with ASTM E329 and shall be experienced in tension testing of post-installed anchoring systems.
   2. Post-installed Anchor Installer:
      a. Mechanical Anchors: Installer shall be experienced and trained by post-installed anchor system manufacturer in proper installation of manufacturer's products. Product installation training by distributors or manufacturer's representatives is unacceptable unless the person furnishing the training is qualified as a trainer by the anchor manufacturer.
      b. Adhesive Anchors: Installation shall be performed by personnel certified under an applicable certification program. Certification shall include written and performance tests in accordance with the ACI/CRSI Adhesive Anchors Installer Certification Program, or equivalent. Description of equivalent programs shall be submitted for

ENGINEER's approval and shall be accepted by the building official having jurisdiction.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Listing of all anchor systems products intended for use in the Work including product type, intended location in the Project, and embedded lengths.
   2. Product Data:
      a. Manufacturer's specifications, load tables, dimension diagrams, acceptable base material conditions, acceptable drilling methods, and acceptable bored hole conditions.
      b. When required by ENGINEER, copies of valid ICC ES reports that presents load-carrying capacities and installation requirements for anchor systems.

B. Informational Submittals: Submit the following:
   1. Certificates:
      a. For each type of anchor bolt or threaded rod, submit copies of laboratory test reports and other data required to demonstrate compliance with the Contract Documents.
      b. Post-installed anchor system manufacturer's certification that installer received training in the proper installation of manufacturer's products required for the Work.
   2. Manufacturer's Instructions:
      a. Installation instructions for each anchor system product proposed for use, including bore hole cleaning procedures and adhesive injection, cure and gel time tables, and temperature ranges (storage, installation and in-service).

1.5 DELIVERY, STORAGE AND HANDLING

A. Storage and Protection:
   1. Keep materials dry during delivery and storage.
   2. Store adhesive materials within manufacturer's recommended storage temperature range.
   3. Protect anchor systems from damage at the Site. Protect products from corrosion and deterioration.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. General:
   1. At locations where conditions dictate that Work specified in other Sections is to be of corrosion resistant materials, provide associated anchor systems of stainless steel materials, unless other corrosion-resistant anchor system material is specified. Provide anchor systems of stainless steel materials where stainless steel materials are required in the Contract Documents.
   2. Stainless Steel Nuts:
      a. For anchor bolts and adhesive anchors, provide ASTM A194/A194M, Grade 8S (Nitronic 60) stainless steel nuts for stainless steel anchors used for anchoring equipment, gates, and weirs, and other locations, if any, where the attachment will require future removal for operation or maintenance. Provide lock washer or double nuts on each anchorage device provided for equipment, as required by equipment manufacturer.
      b. For other locations, provide for each anchorage device a nut as specified or as required by anchor manufacturer. When ASTM A194/A194M, Grade 8S (Nitronic 60) nuts are not required for anchor bolts and adhesive anchors as specified in this Section, provide anti-seizing compound where stainless steel rods are used with stainless steel nuts of the same type.
   3. Materials that can contact potable water or water that will be treated to become potable shall be listed in NSF/ANSI 61.

B. Design Criteria
   1. Size, Length, and Load-carrying Capacity: Comply with the Contract Documents. When size, length or load-carrying capacity of anchor system is not otherwise shown or indicated, provide the following:
      a. Anchor Bolts: Provide size, length, and capacity required to carry design load based on values and requirements of Paragraph 3.2.A of this Section. For conditions outside limits of critical edge distance and spacing in Paragraph 3.2.A of this Section, minimum anchor bolt embedment as shown or indicated in Paragraph 3.2.A of this Section apply and capacity shall be based on requirements of Laws and Regulations, including applicable building codes.
      b. Adhesive Anchors, Expansion Anchors, or Concrete Inserts: Provide size, length, type, and capacity required to carry design load. Anchor capacity shall be based on the procedures required by the building code in effect at the Site. Where Evaluation Service Reports issued by the ICC Evaluation Service are required in this Section, anchor capacities shall be based on design procedure required in the applicable ICC Evaluation Service Report.
         1) General: Determine capacity considering reductions due to installation and inspection procedures, embedment length, strength of base fastening materials, spacing, and edge distance, as indicated

in the manufacturer's design guidelines. For capacity determination, concrete shall be assumed to be in the cracked condition, unless calculations demonstrate that the anchor system will be installed in an area that is not expected to crack under any and all conditions of design loading.

2) Concrete Adhesive Anchors: Unless otherwise shown or indicated in the Contract Documents or approved by ENGINEER, provide minimum embedment depth of the greater of the following: required to develop tensile strength of anchor, or a minimum embedment of 10 anchor diameters; and minimum anchor spacing and edge distance of 12 anchor diameters.
3) Concrete Masonry Adhesive Anchors: Unless otherwise shown or indicated in the Contract Documents or approved by ENGINEER, provide minimum anchor spacing and edge distance as indicated in anchor manufacturer's instructions.
4) Concrete Expansion Anchors: Unless otherwise shown or indicated in the Contract Documents or approved by ENGINEER, provide minimum embedment depth of six anchor diameters, and minimum anchor spacing and edge distance of seven anchor diameters.
5) Concrete Masonry Expansion Anchors: Unless otherwise shown or indicated in the Contract Documents or approved by ENGINEER, provide minimum anchor spacing and edge distance as indicated in anchor manufacturer's instructions.
6) Concrete Undercut Anchors: Unless otherwise shown or indicated in the Contract Documents, or approved by ENGINEER, provide minimum anchor spacing and edge distance as tabulated in anchor manufacturer's instructions.

2. Design Loads. Comply with the Contract Documents. When design load of supported material, equipment, or system is not otherwise shown or indicated, provide the following:
   a. Equipment Anchors: Use design load recommended by equipment manufacturer. When equipment can be filled with fluid, use loads that incorporate equipment load and load imposed by fluid.
   b. Pipe Hangers and Supports: Use full weight of pipe, and fluid contained in pipe that are tributary to the support plus the full weight of valves and accessories located between the hanger or support being anchored and the next hanger or support.
   c. Hangers and Supports for Electrical Systems, and HVAC, Plumbing, and Fire Suppression Systems and Piping: Use the full weight of supported system that is tributary to the support plus the full weight of accessories located between the hanger or support being anchored and the next hanger or support. When piping or equipment is to be filled with fluid, anchor systems shall be sized to support such loads in addition to the weight of the equipment, piping, or system, as applicable.
   d. Delegated Design: When anchor systems are used for supporting materials, equipment, or systems delegated to a design professional retained by CONTRACTOR, Subcontractor, or Supplier, provide

anchor system suitable for loads indicated in delegated design documents and consistent with the design intent expressed in the Contract Documents.

C. Application:
1. Anchor Bolts:
   a. Where anchor bolt is shown or indicated, use cast-in-place anchor bolt unless another anchor type is approved by ENGINEER.
   b. Provide anchor bolts as shown or indicated, or as required to secure structural element to appropriate anchor surface.
2. Concrete Adhesive Anchors:
   a. Use where adhesive anchors are shown or indicated for installation in concrete.
   b. Suitable for use where subject to vibration.
   c. Suitable for use in exterior locations or locations subject to freezing.
   d. Suitable for use in submerged, intermittently submerged, or buried locations.
   e. Do not use in overhead applications, unless otherwise shown or approved by ENGINEER.
   f. Do not use for pipe hangers, unless otherwise shown or approved by ENGINEER.
3. Concrete Masonry Adhesive Anchors:
   a. Use where adhesive anchors are shown or indicated for installation in grout-filled or hollow masonry units.
   b. Suitable for use where subject to vibration.
   c. Suitable for use in exterior locations or locations subject to freezing.
   d. Do not use for pipe hangers, unless otherwise shown or approved by ENGINEER.
4. Concrete Wedge Expansion Anchors:
   a. Use where expansion anchors are shown or indicated for installation in concrete.
   b. Do not use where subject to vibration.
   c. Do not use in exterior locations or locations subject to freezing.
   d. Do not use in submerged, intermittently submerged, or buried locations.
   e. Suitable for use in overhead applications.
5. Grout-filled Concrete Masonry Wedge Expansion Anchors:
   a. Use where expansion anchors are shown or indicated for installation on the interior face of grout-filled unit masonry.
   b. Do not use where subject to vibration.
   c. Do not use in exterior locations or locations subject to freezing.
6. Hollow Concrete Masonry Sleeve Expansion Anchors:
   a. Use where expansion anchors are shown or indicated for installation in hollow concrete unit masonry or solid brick.
   b. Do not use for attaching safety-related systems, such as piping conveying hazardous or potentially hazardous materials, or fire suppression systems.

c. Do not use where subject to vibration.
d. Do not use in exterior locations or locations subject to freezing.

7. Drop-in Expansion Anchors:
   a. Use drop-in expansion anchors installed in concrete where light-duty anchors are required to support piping or conduit two-inch diameter or smaller.
   b. Do not use for attaching safety-related systems, such as piping conveying hazardous or potentially hazardous materials, or fire suppression systems.
   c. Do not use where subject to vibration.
   d. Do not use at submerged, intermittently submerged, or buried locations.
   e. Do not use in exterior locations or locations subject to freezing.
   f. Suitable for use in overhead applications.
8. Concrete Undercut Anchors:
   a. Use where undercut anchors are shown or indicated for installation in concrete.
   b. Suitable for use where subject to vibration.
   c. Do not use in submerged, intermittently submerged, or buried locations.
   d. Do not use in exterior locations or locations subject to freezing.
   e. Suitable for use in overhead applications.
9. Concrete Inserts:
   a. Use only where shown or indicated in the Contract Documents.
   b. Allowed for use to support pipe hangers and pipe supports for pipe size and loading recommended by the concrete insert manufacturer.
10. Drive-In Expansion Anchors:
    a. Use drive-in expansion anchors installed in concrete, precast concrete, grouted masonry units, or brick, where light-duty anchors are required to support piping or conduit one-inch diameter and smaller.
    b. Do not use for attaching safety-related systems, such as piping conveying hazardous or potentially hazardous materials, or fire suppression systems.
    c. Do not use in overhead applications.
11. For Use in Precast Concrete Planks:
    a. To support piping or conduit six-inch diameter and smaller, use low-profile drop-in anchors, hollow concrete masonry adhesive anchors, or through-bolts.
    b. For piping greater than six-inch diameter, or to support safety-related systems, use through-bolts. Each through-bolt shall consist of threaded rod, nuts, washers, and bearing plate.

2.2 MATERIALS

A. Anchor Bolts:

1. Interior Dry Non-Corrosive Locations: Provide straight threaded carbon steel rods complying with ASTM F1554, Grade 36, with heavy hex nuts

complying with ASTM A563 Grade 36, unless otherwise shown or indicated on the Drawings. Hooked anchor bolts are unacceptable.

2. Exterior, Buried, Submerged Locations, or When Exposed to Wastewater: Provide stainless steel straight threaded rods complying with ASTM F593, AISI Type 316, Condition A, with ASTM F594, AISI Type 316, stainless steel nuts. Provide ASTM A194/A194M, Grade 8S (Nitronic 60) stainless steel nuts where required. Other AISI types may be used when approved by ENGINEER. Hooked bolts are unacceptable.
3. Equipment: Provide anchor bolts complying with material requirements of this Section and equipment manufacturer's requirements relative to size, embedment length, and anchor bolt projection. Anchor bolts shall be straight threaded rods with washers and nuts as specified in this Section. Hooked bolts are unacceptable.
4. Anchoring of Structural Elements: Provide anchor bolts of size, material, and strength shown or indicated in the Contract Documents.

B. Concrete Adhesive Anchors:
1. General:
   a. Adhesive anchors shall consist of threaded rods anchored into hardened concrete using an adhesive system.
2. Products and Manufacturers: Provide one of the following:
   a. HIT-RE 500-SD Injection Epoxy Adhesive Anchoring System, by Hilti Fastening Systems, Inc.
   b. SET-XP Epoxy-Tie Adhesive, by Simpson Strong-Tie Company, Inc.
   c. Or equal.
3. Adhesive:
   a. Adhesive system shall use two-component adhesive mix.
   b. Epoxy adhesives shall comply with physical requirements of ASTM C881/C881M, Type IV, Grade 2 and 3, Class A, B, and C, except gel times.
   c. Adhesives shall have a current evaluation report by ICC Evaluation Service for use in both cracked and uncracked concrete with seismic recognition for SDC A through F as tested and assessed in accordance with ICC-ES AC308.
   d. Adhesives shall have minimum bond strength and minimum design bond strength (bond strength multiplied by strength reduction factor) in accordance with Table 05 05 33-A:

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TABLE 05 05 33-A:
ADHESIVE BOND STRENGTH [1,2]

Anchor	Uncracked Concrete		Cracked Concrete	
Rod Diameter / Dowel Size	**Bond Strength (psi)**	**Design Bond Strength (psi)**	**Bond Strength (psi)**	**Design Bond Strength (psi)**
3/8-inch / #3	2040	1300	1090	700
1/2-inch / #4	1920	1200	920	560
5/8-inch / #5	1830	1150	710	390
3/4-inch / #6	1760	1050	710	460
7/8inch / #7	1670	900	610	340
1-inch / #8	1650	1050	850	460
- / #9	1900	1000	800	400
1.25-inch/ #10	1580	1000	730	400

Table Notes:
1. Bond strengths listed for hammer-drilled, dry hole.
2. Bond strengths listed for maximum short term concrete temperature of 110 degrees F and maximum long term concrete temperature of 75 degrees F.

4. Anchor:
   a. Provide continuously-threaded, AISI Type 316 stainless steel adhesive anchor rod. Threaded rods shall comply with the concrete adhesive anchor manufacturer's specifications as included in the ICC Service Evaluation Report for the anchor submitted. Nuts shall have specified proof load stresses equal to or greater than the minimum tensile strength of the stainless steel threaded rod used. Provide ASTM A194/A194M, Grade 8S (Nitronic 60) stainless steel nuts where required.

C. Concrete Masonry Adhesive Anchors:
   1. General:
      a. Grout-filled concrete masonry adhesive anchors shall consist of threaded rods anchored into grout-filled concrete block masonry using an adhesive system.
      b. Hollow concrete masonry adhesive anchors shall consist of threaded rods with a cylindrical mesh steel or plastic screen tube anchored into hollow concrete block masonry using an adhesive system.
   2. Products and Manufacturers: Provide one of the following:
      a. HIT-HY 70 Hybrid Adhesive Anchor System, by Hilti Fastening Systems, Inc.
      b. Acrylic-Tie Adhesive, by Simpson Strong-Tie Company, Inc.
      c. Or equal.
   3. Adhesive:
      a. Adhesive system shall use two-component adhesive mix.
      b. Hybrid adhesives shall comply with the following:
         1) ASTM D695 compressive yield strength greater than 7,200 psi on a seven-day cure.

c. Adhesives shall have current ICC Evaluation Service Report for use in grout-filled concrete masonry, tested and assessed in accordance with ICC-ES AC 58 and ICC-ES AC 60.

4. Anchor:
   a. Provide stainless steel adhesive anchor rod complying with ASTM F593, AISI Type 316, Condition CW, with ASTM F594, AISI Type 316 stainless steel nuts. Provide ASTM A194/A194M, Grade 8S (Nitronic 60) stainless steel nuts where required.
5. Mesh Screen Tube (for hollow masonry applications):
   a. Provide with mesh size, length, and diameter as specified by adhesive anchor manufacturer.

D. Concrete Wedge Expansion Anchors:
1. General:
   a. Concrete wedge expansion anchors shall consist of stud, wedge, nut, and washer.
2. Products and Manufacturers: Provide one of the following:
   a. Kwik Bolt TZ Wedge Anchor, by Hilti Fastening Systems, Inc.
   b. Strong Bolt 2 Wedge Anchor, by Simpson Strong-Tie Company, Inc.
   c. Or equal.
3. Anchors shall comply with physical requirements of FS A-A-1923A, Type 4. Provide concrete wedge expansion anchors suitable for use in cracked and uncracked concrete in accordance with ACI 318 and ACI 350, Appendix D. Demonstrate suitability of cracked concrete wedge anchors in accordance with ACI 355.2 prequalification tests.
4. Interior Dry Non-Corrosive Locations: Provide carbon steel anchors complete with nuts and washers, zinc plated, in accordance with ASTM B633.
5. Other Locations: Provide expansion anchors complete with nuts and washers, AISI Type 304 stainless steel anchor body, in accordance with ASTM A276 or ASTM A493.
6. Concrete wedge expansion anchors shall have a current ICC Evaluation Service Report for use in both cracked and uncracked concrete with seismic recognition in seismic design Categories A through F when tested and assessed in accordance with ICC-ES AC193.

E. Grout-filled Masonry Wedge Expansion Anchors:
1. General:
   a. Grout-filled masonry wedge expansion anchors shall each consist of stud, wedge, nut, and washer.
2. Product and Manufacturers: Provide one of the following:
   a. Kwik-Bolt 3 Expansion Anchors, by Hilti Fastening Systems, Inc.
   b. Wedge-All Wedge Anchors, by Simpson Strong-Tie Company, Inc.
   c. Or equal.
3. Anchors shall comply with physical requirements of FS A-A-1923A, Type 4. Anchors shall be non-bottom bearing type with single-piece steel expansion clip providing 360-degree contact with base material and shall not require oversized holes for installation.

4. Interior Dry Non-Corrosive Locations: Provide carbon steel anchors complete with nuts and washers, zinc plated, in accordance with ASTM B633.
5. Other Locations: Provide AISI Type 316 stainless steel anchor, complete with nut and washer, in accordance with ASTM A276 or ASTM A493.
6. Grout-filled masonry wedge expansion anchors shall have a current ICC Evaluation Service report for use in fully-grouted concrete masonry construction when tested and assessed in accordance with ICC-ES AC01.

F. Hollow Concrete Masonry Sleeve Expansion Anchors:
1. General:
   a. Sleeve expansion anchors shall each consist of an externally threaded stud with full length expanding sleeve.
2. Products and Manufacturers: Provide one of the following:
   a. HLC Sleeve Anchors, by Hilti Fastening Systems, Inc.
   b. Dynabolt Sleeve Anchors, by ITW Red Head.
   c. Or equal.
3. Anchors shall comply with physical requirements of FS A-A-1922A. Anchors shall be non-bottom bearing type with single-piece steel expansion sleeve providing 360-degree contact with base material, and shall not require oversized holes for installation.
4. Interior Dry Non-Corrosive Locations: Provide carbon steel anchors complete with nuts and washers, zinc plated, in accordance with ASTM B633.
5. Other Locations: Provide expansion anchors complete with nuts and washers, Type 304 stainless steel, in accordance with ASTM A276 or ASTM A493.

G. Drop-in Expansion Anchors:
1. General:
   a. Drop-in expansion anchors shall each consist of an internally threaded, deformation-controlled expansion anchor with pre-assembled expander plug.
2. Products and Manufacturers: Provide one of the following:
   a. HDI Drop-In Anchors, by Hilti Fastening Systems, Inc.
   b. Drop-In Anchor, by Simpson Strong-Tie Company, Inc.
   c. Or equal.
3. Provide carbon steel anchors complete with nuts and washers, zinc plated, in accordance with ASTM B633, complying with physical requirements of FS A-A-55614, Type I. Anchors shall be flush or shell type. Provide low-profile anchors for use in precast concrete planks.

H. Concrete Undercut Anchors:
1. General:
   a. Each concrete undercut anchor shall consist of threaded stud, thick-walled expansion sleeve, expander coupler, and nut and washer. Anchors shall be pre-set type or through-set type, as shown on the Drawings.

2. Products and Manufacturers: Provide one of the following:
   a. HDA Undercut Anchor, by Hilti Fastening Systems, Inc.
   b. DUC Ductile Undercut Anchor, by USP Structural Connectors.
   c. Or equal
3. Provide concrete undercut expansion anchors in accordance with ACI 318 and ACI 350, Appendix D. Demonstrate suitability of cracked concrete undercut anchors in accordance with ACI 355.2 prequalification tests.
4. Installed anchor shall exhibit form fit between bearing elements and the undercut in the concrete.
5. Interior Dry Non-Corrosive Locations: Provide carbon steel anchors, complete with nuts and washers, zinc plated, in accordance with ASTM B633.
6. Other Locations: Provide stainless steel anchors, complete with nuts and washers, manufactured of AISI Type 316 stainless steel or materials complying with ISO 3506-1 and having corrosion resistance equivalent to AISI Type 316 stainless steel.
7. Concrete undercut anchors shall have a current ICC Evaluation Service Report for use in both cracked and uncracked concrete for seismic recognition for seismic design Categories A through F when tested and assessed in accordance with ICC-ES AC193.

I. Concrete Inserts:
1. Manufacturers: Provide products of one of the following:
   a. Unistrut Corporation.
   b. Cooper B-Line, Inc.
   c. Anvil International, Inc.
   d. Or equal.
2. Spot Concrete Inserts:
   a. Provide inserts recommended by insert manufacturer for required loading. Inserts shall comply with ANSI/MSS SP-58, malleable iron, Type 18. Spot inserts shall allow for lateral adjustment and have means for attachment to forms. Provide nuts compatible with insert and to suit threaded hanger rod sizes.
3. Continuous Concrete Inserts:
   a. Provide inserts recommended by insert manufacturer for required loading. Inserts shall be continuous type and shall be manufactured from minimum 12-gage cold-formed channel sections, complying with ASTM A1011/A1011M, stainless steel, Grade 33, complete with styrofoam inserts, end caps, and means for attaching to forms. Provide channel nuts compatible with insert suitable for threaded hanger rod sizes.
4. Provide inserts with plain finish.

J. Drive-In Expansion Anchors:
1. General:
   a. Drive-In expansion anchors shall each consist of stainless steel drive pin and expanding alloy body.

2. Products and Manufacturers: Provide one of the following:
   a. Metal HIT Anchor, by Hilti Fastening Systems, Inc.
   b. Zinc Nailon Anchor, by Simpson Strong-Tie Company, Inc.
   c. Or equal.
3. Provide Type 304 stainless steel drive pin with zinc alloy body. Anchor shall comply with physical requirements of FS A-A-1925A, Type 1.

K. Unless approved by ENGINEER, do not use power-actuated fasteners or other types of bolts and fasteners not specified in this Section.

L. Anti-Seizing Compound:
1. Products and Manufacturers: Provide one of the following:
   a. Pure Nickel Never-Seez, by Bostik.
   b. Nickel-Graf, by Anti-Seize Technology.
   c. Or equal.
2. Provide pure nickel anti-seizing compound.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine conditions under which materials will be installed and advise ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Anchor Bolts:
1. Provide anchor bolts as shown or indicated in the Contract Documents, or as required to secure structural element to the appropriate anchor surface.
2. Locate and accurately set anchor bolts using templates or other devices as required, prior to placing concrete. Wet setting of anchor bolts is unacceptable.
3. Protect threads and shank from damage during installation and subsequent construction operations.
4. Unless otherwise shown or approved by ENGINEER anchor bolts shall comply with Table 05 05 33-B:

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TABLE 05 05 33-B:
SINGLE ANCHOR ALLOWABLE LOADS ON ANCHOR BOLTS [1]

Bolt Diameter (inch)	F1554 Grade 36				F1554			
	F593 Type 316, Condition A				Grade 55			
	Minimum Embedment (inch)	Minimum Edge Distance and Spacing[2] (inch)	Shear[3,4] (lb)	Tension[3] (lb)	Minimum Embedment (inch)	Minimum Edge Distance and Spacing[2] (inch)	Shear[3] (lb)	Tension[3] (lb)
1/2	6	9	947	1,815	8.5	12.75	1,245	2,393
5/8	7.5	11.25	1,508	2,895	10.5	15.75	1,980	3,810
3/4	9	13.5	2,231	4,290	13	19.5	2,933	5,640
7/8	10.5	15.75	3,080	5,918	15	22.5	4,050	7,793
1	12	18	4,040	7,770	17	25.5	5,318	10,088
1 1/8	13.5	20.25	5,090	9,789	19	28.5	8,930	12,435
1.1/4	15	22.5	6,463	12,429	21	31.5	8,505	15,030

Table Notes:

1. Table is based on ACI 318 and ACI 350, Appendix D, f'_c = 4000 psi. Table 05 05 33-B is not applicable to anchor bolts embedded in grouted masonry.
2. Critical edge distance and spacing are indicated in the table. Capacity of anchor bolts for other combination of edge distances and spacing shall be evaluated in accordance with ACI 318 and ACI 350, Appendix D.
3. Values for shear and tension listed are not considered to act concurrently. Interaction of tension and shear will be evaluated by ENGINEER in accordance with ACI 318 and ACI 350, Appendix D.

B. Adhesive Anchors, Undercut Anchors, and Expansion Anchors – General:
   1. Prior to drilling, locate existing reinforcing steel in vicinity of proposed holes. If reinforcing conflicts with proposed hole location, obtain ENGINEER'S approval of alternate hole locations to avoid drilling through or damaging existing reinforcing bars.

C. Adhesive Anchors:
   1. Comply with manufacturer's written installation instructions and the following.
   2. Drill holes to adhesive system manufacturer's recommended drill bit diameter to the specified depth. Drill holes in hammering and rotation mode with carbide-tipped drill bits that comply with the tolerances of ANSI B212.15. Core-drilled holes are unacceptable.
   3. Before setting adhesive anchor, hole shall be made free of dust and debris by method recommended by adhesive anchor system manufacturer. Hole shall be brushed with adhesive system manufacturer-approved brush and blown clean with clean, dry, oil-free compressed air to remove all dust and loose particles. Hole shall be dry as defined by adhesive system manufacturer.
   4. Before injecting adhesive, obtain ENGINEER's concurrence that hole is dry and free of oil and other contaminants.

5. Prior to injecting adhesive into the drilled hole, dispense, to a location appropriate for such waste, an initial amount of adhesive from the mixing nozzle, until adhesive is uniform color.
6. Inject adhesive into hole through injection system-mixing nozzle and necessary extension tubes, placed to bottom of hole. Discharge end shall be withdrawn as adhesive is placed but kept immersed to prevent formation of air pockets. Fill hole to depth that ensures that excess material is expelled from hole during anchor placement.
7. Twist anchors during insertion into partially-filled hole to guarantee full wetting of rod surface with adhesive. Insert rod slowly to avoid developing air pockets.
8. Provide adequate curing in accordance to adhesive system manufacturer's requirements prior to continuing with adjoining Work that could place load on installed adhesive anchors. Do not begin adjoining Work until adhesive anchors are successfully tested or when allowed by ENGINEER.
9. Limitations:
    a. At time of anchor installation, concrete shall have compressive strength (f'c) of not less than 2,500 psi.
    b. At time of anchor installation, concrete shall have age of not less than 21 days.
    c. Installation Temperature: Comply with manufacturer's instructions for installation temperature requirements. Provide temporary protection and other measures, such as heated enclosures, necessary to ensure that base material temperature complies with anchor systems manufacturer's requirements during installation and curing of adhesive anchor system.
    d. Oversized Holes: Advise ENGINEER immediately if size of drilled hole is larger than recommended by anchor system manufacturer. Cost of corrective measures, including but not limited to redesign of anchors due to decreased anchor capacities, shall be paid by CONTRACTOR.
    e. Embedment depths shall be based on installation in normal-weight concrete with compressive strength of 2,500 psi when embedded in existing concrete, and 4,000 psi when embedded in new concrete.

D. Expansion Anchors:
1. Comply with expansion anchor manufacturer's written installation instructions and the following:
2. Drill holes using anchor system manufacturer's recommended drill bit diameter and to the specified depth. Drill holes in hammering and rotation mode with carbide-tipped drill bits complying with tolerances of ANSI B212.15. Core drilled holes are unacceptable.
3. Before installing anchor, hole shall be made free of dust and debris by method recommended by anchor system manufacturer. Hole shall be brushed with anchor system manufacturer-approved brush and blown clean with clean, dry, oil-free compressed air to remove all dust and loose particles.

4. Before installing anchor, obtain ENGINEER's concurrence that hole is dry and free of oil and other contaminants.
5. Protect threads from damage during anchor installation. Drive anchors not less than four threads below surface of the attachment. Set anchors to anchor manufacturer's recommended torque using a torque wrench.

E. Concrete Undercut Anchors:
1. Comply with undercut anchor manufacturer's written installation instructions and the following.
2. Protect threads from damage during anchor installation.
3. Drill hole to anchor manufacturer's specified depth and diameter using a drill bit matched to the specific anchor.
4. Before setting the undercut anchor, hole shall be free of dust and debris using method recommended by undercut anchor system manufacturer. Hole shall be blown clean with clean, dry, oil-free compressed air to remove all dust and loose particles.
5. Insert the anchor by hand until anchor reaches bottom of hole.
6. Set anchor in accordance with manufacturer's instructions using anchor manufacturer's specified setting tool.
7. Verify that the setting mark is visible on the threaded rod above the sleeve.
8. Anchor shall be set to manufacturer's recommended torque, using a torque wrench.

F. Concrete Inserts:
1. Comply with concrete insert manufacturer's installation instructions.
2. Inserts shall be flush with slab bottom surface.
3. Protect embedded items from damage during concrete placing. Ensure that embedded items are securely fastened to prevent movement during concrete placing, and ensure that embedded items do fill with concrete during concrete placing.
4. Inserts intended for piping greater than four-inch diameter shall be provided with hooked rods attached to concrete reinforcing.

G. Anti-Seizing Compound:
1. Provide anti-seizing compound in accordance with anti-seizing compound manufacturer's installation instructions, at locations indicated in Paragraph 2.1.B of this Section.
2. Do not use anti-seizing compound at locations where anchor bolt or adhesive anchor will contact potable water or water that will be treated to become potable.

3.3 CLEANING

A. After embedding concrete is placed, remove protection and clean bolts and inserts.

3.4 FIELD QUALITY CONTROL

A. Site Tests:
   1. Furnish services of independent testing laboratory to perform field quality tensile testing of production adhesive anchors at the Site, unless otherwise specified.
      a. Testing shall comply with ASTM E488.
      b. Test at least ten percent of all types of adhesive anchors. If one or more adhesive anchors fail the test, CONTRACTOR shall pay cost of testing, or at ENGINEER's option CONTRACTOR may arrange for testing paid by CONTRACTOR, for all adhesive anchors of same diameter and type installed on the same day as the failed anchor. If anchors installed on the same day as the failed anchor also fail the test, ENGINEER may require retesting of all anchors of the same diameter and type installed in the Work. CONTRACTOR shall be responsible for retesting costs.
      c. ENGINEER will direct which adhesive anchors are to be tested and indicate test load to be used
      d. Apply test loads with hydraulic ram.
      e. Displacement of post-installed anchors shall not exceed D/10, where D is nominal diameter of anchor being tested.
   2. Mechanical Anchors:
      a. Responsibility:
         1) CONTRACTOR shall demonstrate competence in installing mechanical anchors by performing field quality control tests.
      b. Perform field quality control tests on test anchors at location directed by ENGINEER. Test anchors shall not be part of the finished Work.
      c. Test not less than one installation of each type of mechanical anchor used in the Work.
         1) Load each test anchor to failure.
         2) Testing shall comply with ASTM E488.
         3) Apply test loads with hydraulic ram.
      d. Anchors that fail to reach the specified test load shall be considered as not passing the test and shall be re-tested at no additional cost to Department.
      e. Testing agency shall submit test results to CONTRACTOR and ENGINEER within 24 hours of completion of test.
   3. Correct defective Work by removing and replacing or correcting, as directed by ENGINEER.
   4. CONTRACTOR shall pay for all corrections and subsequent testing required to confirm competence in the installation of post-installed mechanical anchors.
   5. Testing agency shall submit test results to CONTRACTOR and ENGINEER within 24 hours of completion of test.

B. Manufacturer's Services:
   1. Provide at the Site services of qualified adhesive manufacturer's representative during initial installation of adhesive anchor systems to train

CONTRACTOR's personnel in proper installation procedures. Manufacturer's representative shall observe to confirm that installer demonstrates proper installation procedures for adhesive anchors and adhesive material.

+ + END OF SECTION + +

SECTION 05 12 00

STRUCTURAL STEEL FRAMING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install structural steel framing, including surface preparation and shop priming.
   2. Structural steel framing is the Work defined in AISC 303, Section 2, and as shown or indicated in the Contract Documents. The Work also includes:
      a. Providing openings in and attachments to structural steel framing to accommodate the Work under this and other Sections, and providing for structural steel framing items such as anchorage devices, studs, and all items required for which provision is not specifically included under other Sections.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before structural steel framing Work.

C. Related Sections:
   1. Section 03 60 00, Grouting.
   2. Section 05 05 33, Anchor Systems.
   3. Section 09 91 00, Painting.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. AISC 303, Code of Standard Practice for Steel Buildings and Bridges.
   2. AISC 325, Steel Construction Manual.
   3. AISC 360, Specification for Structural Steel Buildings.
   4. ASME B46.1, Surface Texture (Surface Roughness, Waviness and Lay).
   5. ASTM A6/A6M, Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
   6. ASTM A36/A36M, Specification for Carbon Structural Steel.
   7. ASTM A53/A53M, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   8. ASTM A108, Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
   9. ASTM A194/A194M, Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.

10. ASTM A325, Specification for Structural Bolts, Steel, Heat-Treated, 120/105 ksi Minimum Tensile Strength.
11. ASTM A490, Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength.
12. ASTM A500/A500M, Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
13. ASTM A563, Specification for Carbon and Alloy Steel Nuts.
14. ASTM A572/A572M, Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
15. ASTM A992/A992M, Specification for Structural Steel Shapes.
16. ASTM E329, for Agencies Engaged in Construction Inspection, Special Inspection, or Testing Materials Used in Construction.
17. ASTM F436, Specification for Hardened Steel Washers.
18. ASTM F593, Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
19. ASTM F959, Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.
20 ASTM F1852, Specification for "Twist off" Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
21. AWS D1.1/D1.1M, Structural Welding Code-Steel.
22. CMAA 74, Specifications for Top Running & Under Running Single Girder Electric Traveling Cranes Utilizing Under Running Trolley Hoist.
23. ISO 2859-1, Sampling Procedures for Inspection by Attributes -- Part 1: Sampling Schemes Indexed by Acceptance Quality Limit (AQL) for Lot-by-Lot Inspection.
24. ISO 4017, Hexagon Head Screws -- Product Grades A and B.
25. RCSC Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Steel Fabricator:
      a. Structural steel fabricating plant shall possess current certificate from AISC stating that the fabrication facility complies with requirements for certification of "Standard for Steel Building Structures (STD)" of AISC's quality certification program. Fabricating plant shall maintain this certification throughout time of fabrication for this Project.
   2. Welders and Welding Processes:
      a. Qualify welding processes and welding operators in accordance with AWS D1.1/D1.1M, Section 5, Qualification.
      b. Each welder employed on or to be employed for the Work shall possess current AWS certification in the welding process with which welder will be working. Certifications shall be current and valid throughout the Work.

3. Surveyor:
    a. Engage a registered professional land surveyor legally qualified to practice in the same jurisdiction as the Site, and experienced in providing surveying services of the kind indicated.
    b. Responsibilities include but are not necessarily limited to:
        1) Performing or supervising performance of field survey work to check lines and elevations of concrete and masonry bearing surfaces, and locations of anchorage devices and similar devices, before steel erection proceeds.
        2) Notifying CONTRACTOR and ENGINEER in writing when surveyed Work does not comply with the Contract Documents.
        3) Submit to CONTRACTOR field survey reports.
4. Testing Laboratory:
    a. CONTRACTOR shall retain the services of an independent testing laboratory to perform testing and determine compliance with the Contract Documents of the materials specified in this Section.
    b. Laboratory shall comply with ASTM E329.
    c. Testing laboratory shall be experienced in the types of testing required.
    d. Welding inspection and welding inspector qualifications shall be in accordance with AWS D1.1/D1.1M
    e. Selection of testing laboratory is subject to ENGINEER's acceptance
5. Delegated Design ENGINEER:
    a. The Shop Drawings and calculations shall be prepared by a Registered Professional ENGINEER licensed in the State of New York and is a recognized expert in the type of Work shown and specified.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
    1. Shop Drawings:
        a. Complete details and schedules for fabrication and shop assembly of members and details, schedules, procedures, and diagrams showing proposed sequence of erection. Shop Drawings shall not be reproductions of Contract Drawings.
        b. Include complete information for fabrication of the structure's components, including but not limited to location, type, and size of bolts, details of blocks, copes and cuts, connections, camber, holes, member sizes and lengths, and other pertinent data. Clearly indicate welds using standard AWS notations and symbols, and clearly show or indicate size, length, and type of each weld.
        c. Setting drawings, templates, and directions for installing anchorage devices.
    2. Product Data:
        a. Manufacturer's specifications and installation instructions for products listed below.
            1) High-strength bolts of each type, including nuts and washers.
            2) Welding electrodes and rods.
            3) Load indicator bolts and washers.

B. Informational Submittals: Submit the following:
   1. Certificates.
      a. Fabricator's AISC quality certification.
      b. Welders' certifications.
      c. Certified reports of laboratory tests on previously-manufactured, identical materials, and other data as necessary, to demonstrate compliance with the Contract Documents for the materials listed below:
         1) Structural steel of each type, including certified mill reports indicating chemical and physical properties.
         2) High-strength bolts of each type, including nuts and washers.
   2. Supplier Instructions:
      a. Installation data, handling, and storage instructions.
   3. Source Quality Control Submittals:
      a. When performed or when required by ENGINEER, submit results of source quality control testing and inspections performed at the mill or shop.
   4. Field Quality Control Submittals:
      a. Written field survey reports for all bearing surfaces surveyed, verifying tolerance requirements, areas out of tolerance, and corrective measures required.
   5. Qualifications Statements.
      a. Land surveyor.
   6. Delegated Design Submittals:
      a. Provide signed and sealed Shop Drawings and calculations, which are prepared by a Registered Professional Engineer licensed in the State of New York.

1.5 DELIVERY, STORAGE AND HANDLING

A. Storage:
   1. Protect steel members and packaged materials from corrosion and deterioration.
   2. Do not store materials in or on the building or structure in manner that may cause distortion or damage to structural steel members, building, or supporting structures.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Steel Types:
   1. W-Shapes and WT-Shapes: ASTM A992/A992M.
   2. S-shapes and Channels: ASTM A572/A572M, Grade 50.
   3. Hollow Structural Sections: ASTM A500/A500M, Grade B
   4. Angles, Plates, and Bars: ASTM A36/A36M.
   5. Steel Pipe: ASTM A53/A53M, Grade B.

B. Anchorages, Fasteners, and Connectors:
   1. Anchorage Devices: Refer to Section 05 05 33, Anchor Systems.
   2. Headed Stud Type Shear Connectors: ASTM A108, Grades 1010/1020, complying with AWS D1.1/D1.1M, Section 7.
   3. High-Strength Threaded Fasteners: Heavy hexagonal structural bolts, heavy hexagon nuts, and hardened washers, as follows:
      a. Unless otherwise indicated, fasteners shall be quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A325, Type I, nuts complying with ASTM A563C, A563DH or A194/A194M 2H, and hardened washers complying with ASTM F436. Bolts, nuts and washers shall be hot-dip galvanized where shown or indicated.
      b. Use quenched and tempered alloy steel bolts, nuts and washers, complying with ASTM A490, only at locations where shown or indicated in the Contract Documents. ASTM A490 bolts shall not be galvanized.
      c. Tension control bolts, when used, shall comply with ASTM F1852.
      d. Compressible washer-type direct-tension indicators, when used, shall comply with ASTM F959, Type 325.
   4. Threaded Rod: Provide threaded rods with heavy hexagon nuts, and hardened washers, as follows:
      a. Interior and Dry Locations: Provide threaded carbon steel rods complying with ASTM A36, with heavy hex nuts complying with ASTM A563A, unless otherwise shown or indicated on the Drawings.
      b. Exterior, Buried, or Submerged Locations, or When Exposed to Wastewater: Provide stainless steel threaded rods complete with washers complying with ASTM F593, AISI Type 316, Condition A, with ASTM A194/A194M, Grade 8S (nitronic 60) stainless steel nuts. Other AISI types may be used when approved by ENGINEER.

C. Electrodes for Welding: E70XX complying with AWS D1.1/D1.1M.

2.2 FABRICATION

A. Shop Fabrication and Assembly:
   1. General:
      a. Fabricate and assemble structural assemblies in the shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC 325, the Contract Documents, and as shown on approved Shop Drawings. Provide camber in structural members as shown or indicated.
      b. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize handling of materials for storage and minimize handling at the Site.
      c. Where finishing is required, complete the assembly, including welding of units, before commencing finishing operations. Provide finish surfaces of members exposed-to-view in the completed Work that are free of markings, burrs, and other defects.

B. Connections:
   1. Shop Connections:
      a. Unless otherwise shown or indicated, shop connections may be welded or high-strength bolted connections. Welds shall be 3/16-inch minimum.
      b. Where reaction values of beam are not shown or indicated, connections shall be detailed to support one-half the total uniform load capacity tabulated in tables contained in AISC 325 for allowable loads on beams for the associated shape, span, and steel specified for the beam.
      c. Shop-welded connections shall be detailed to eliminate or minimize eccentricity in the connection.
      d. End-connection angles fastened to webs of beams and girders, and the thickness of angles, size, and extent of fasteners or shop welds, shall comply with tables of "Framed Beam Connections" in AISC 325. Connections shall be two-sided, unless otherwise shown or indicated.
   2. Field Connections:
      a. Field connections, unless otherwise shown or indicated, shall be made with high-strength bolts, and shall be bearing-type connections.
      b. Use field welding only where shown or indicated or where approved by ENGINEER.
   3. High-Strength Bolted Construction:
      a. Provide high-strength threaded fasteners in accordance with RCSC Specifications for Structural Joints using ASTM A325 or ASTM A490 Bolts.
      b. High-strength bolt design shear values shall be as specified in AISC 325 for bolts with threads in the shear plane for bearing type connections, or as specified in this Section for slip-critical connections.
      c. Bolted connections shown or indicated as "SC" shall comply with slip-critical connection requirements in RCSC Specifications for Structural Joints Using ASTM A325 or ASTM A490 Bolts.
         1) Faying surfaces shall have a Class A surface condition.
         2) Slip-critical bolts shall be fully pre-tensioned to 70 percent of minimum specified tensile strength of the bolt using one of the following methods:
            a) Turn of nut with matchmarking.
            b) Twist-off tension control bolt (ASTM F1852).
            c) Direct tension indicator washer (ASTM F959).
      d. Minimum bolt diameter shall be 3/4-inch, unless otherwise shown or indicated.
   4. Welded Construction: Comply with AWS D1.1/D1.1M for procedures, appearance, and quality of welds, and methods used in correcting defective welding Work.
   5. Where rigid connections are required by stresses shown or indicated, provide web shear reinforcement and stiffeners in accordance with AISC 360.

6. Moment connections shown but not detailed on the Drawings shall be detailed for bending moments and shears indicated on the Drawings.

C. Bracing:
   1. Bracing for which stress is not shown or indicated shall have minimum two-bolt connection, or shop-welded connection of equivalent strength.
   2. Vertical bracing and knee braces connecting to columns shall be on the centerline of columns, unless otherwise shown or indicated.
   3. Knee braces shall be at 45-degree angle, unless otherwise shown or indicated.
   4. Gussets shall be not less than 3/8-inch thick, unless otherwise shown or indicated.

D. Columns: Column shafts shall have finished bearing surface roughness not greater than 500 micro-inch in accordance with ASME B46.1, and ends shall be square within tolerances for milled ends in accordance with ASTM A6/A6M at the base and at splice lines.

E. Structural Tubing: Properly seal structural tubing to protect internal surfaces.

F. Holes and Appurtenances for Other Work:
   1. Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on the approved Shop Drawings. If large block-outs are required and approved, reinforce the webs to develop specified shears. Provide threaded nuts welded to framing and other specialty items as shown or indicated to receive other work.
   2. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.

2.3 FINISHING

A. Surface Preparation and Shop Priming: Structural steel shall be primed in the shop. For surface preparation and shop priming requirements refer to Section 09 91 00, Painting.

2.4 SOURCE QUALITY CONTROL

A. Inspection and Testing at the Mill or Shop:
   1. Perform fabricator's standard procedures for source quality control, including inspections and testing.
   2. Materials and fabrication procedures shall be subject to inspection and tests in mill and shop, conducted by a qualified inspection laboratory. Such inspections and tests do not relieve CONTRACTOR of responsibility for providing the Work in accordance with the Contract Documents.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine areas and conditions under which the Work will be performed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 ERECTION

A. General: Comply with AISC 303, AISC 360, and the Contract Documents.

B. Checking of Lines and Elevations: Before proceeding with structural steel erection, furnish services of a qualified surveyor to check lines and elevations of concrete and masonry bearing surfaces, and locations of anchorage devices and similar devices. Immediately report discrepancies to ENGINEER. Do not proceed with erection until defective Work that will support structural steel is corrected, including agreeing with ENGINEER upon compensating adjustments (if any) to structural steel Work.

C. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy-lines to achieve proper alignment of structures as erection proceeds.

D. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete the Work. Provide sufficient planking to comply with Laws and Regulations, and provide tightly-planked substantial floor within two stories or 30 feet, whichever is less, below each tier of steel beams on which work is performed.

E. Anchorage Devices:
   1. Provide anchorage devices, including anchor bolts, and other connectors required for securing structural steel to foundations and other in-place construction.
   2. Provide templates and other devices necessary for presetting anchorage devices to accurate locations.
   3. Refer to Section 05 05 33, Anchor Systems, for anchorage requirements.

F. Setting Bases and Bearing Plates:
   1. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.
   2. Set loose and attached base plates and bearing plates for structural members on steel wedges or other adjusting devices.

3. Tighten anchorage devices after supported members are positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
4. Place grout between bearing surfaces and bases or plates in accordance with Section 03 60 00, Grouting. Finish exposed surfaces, protect installed materials, and allow to cure in accordance with grout manufacturer's instructions, and as otherwise required.
5. Do not use leveling plates or wood wedges.

G. Field Assembly:
1. Set structural frames accurately to the lines and elevations shown and indicated. Align and adjust the various members forming part of a complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
2. Level and plumb individual members of structure within tolerances as specified in AISC 325. For members requiring accurate alignment, provide clip angles, lintels, and other members, with slotted holes for horizontal adjustment at least 3/8-inch in each direction, or more when required.
3. Splice members only where shown or indicated.

H. Erection Bolts: On exposed-to-view, welded construction, remove erection bolts, fill holes with plug welds, and grind smooth at exposed surfaces.

I. Connections:
1. Comply with AISC 325 for bearing, adequacy of temporary connections, alignment, and the removal of paint on surfaces adjacent to field welds.
2. Do not enlarge inadequate holes in members by burning or by using drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.

J. Gas Cutting: Do not use gas-cutting torches for correcting fabrication defects in structural framing. Cutting will be allowed only on secondary members that are not under stress, as approved by ENGINEER. Finish gas-cut sections equal to a sheared appearance, when allowed.

K. Touch-up Painting:
1. Unless otherwise specified, comply with touch-up painting requirements in Section 09 91 00, Painting.
2. Immediately after erection, clean field welds, bolted connections, and damaged or abraded areas of shop-applied paint. Apply paint to exposed areas with the same paint or coating material applied in the shop. Apply by brush or spray to provide not less than the dry film thickness specified in Section 09 91 00, Painting.

3.3 FIELD QUALITY CONTROL

A. Site Tests and Inspections: Materials and erection procedures shall be subject to inspection and tests at the Site conducted by qualified inspection laboratory. Such inspections and tests do not relieve CONTRACTOR of responsibility for providing the Work in accordance with the Contract Documents.

1. Engage independent testing and inspection laboratory to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports.
   a. Testing laboratory shall conduct and interpret tests, prepare and state in each report of results whether test specimens comply with the Contract Documents and specifically indicate all deviations.
   b. High-strength Bolted Connections: Each high-strength bolted connection shall be visually inspected. Inspection shall identify whether the Work complies with Sections 2, 3, and 8 of RCSC Specifications for Structural Joints Using ASTM A325 or A490 Bolts.
      1) For connections that are slip-critical or subject to axial tension, inspector shall verify proper pre-tensioning.
      2) For connections that are not slip critical and not subject to direct tension, bolt does not need to be inspected for bolt tension, but shall be visually inspected to verify that plies of connected elements are in snug contact.
      3) Where bolts or connections are defective, correct defective workmanship, remove and replace, or correct as required defective bolts and connections. CONTRACTOR shall pay for correcting defective Work and tests required to confirm integrity of corrected Work.
   c. Welds: Each weld shall be visually inspected.
      1) Where visually defective welds are evident, further test welds using non-destructive methods. If welds are determined to be acceptable, OWNER will pay for non-destructive testing. When welds are defective, CONTRACTOR shall pay for non-destructive testing.
      2) Correct, or remove and replace, defective Work as directed by ENGINEER.
      3) CONTRACTOR shall pay for corrections and subsequent tests required to determine weld compliance with the Contract Documents.

+ + END OF SECTION + +

SECTION 05 50 13

MISCELLANEOUS METAL FABRICATIONS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish miscellaneous metal fabrications including surface preparation and shop priming.
   2. The Work also includes:
      a. Providing openings in miscellaneous metal fabrications to accom-modate the Work under this and other Sections, and attaching to miscellaneous metal fabrications all items such as sleeves, bands, studs, fasteners, and all items required for which provision is not specifically included under other Sections.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the Work to be installed with, or attached to miscellaneous metal fabrications Work.
   2. Hot-dip Galvanizing: Coordinate with steel fabricator detailing for and fabrication of assemblies to be hot-dip galvanized, to minimize distortion during galvanizing process.

C. Related Sections:
   1. Section 03 60 00, Grouting.
   2. Section 05 05 33, Anchor Systems.
   3. Section 05 52 15, Aluminum Handrails and Railings.
   4. Section 09 91 00, Painting,

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ANSI A14.3, Ladders – Fixed –Safety Requirements.
   2. ANSI Z359.1, Safety Requirements for Personal Fall Arrest Systems, Subsystems, and Components.
   3. ASTM A36/A36M, Specification for Carbon Structural Steel.
   4. ASTM A53/A53M, Specification for Pipe Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   5. ASTM A123/A123M, Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   6. ASTM A153/A153M, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

7. ASTM A240/A240M, Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications.
8. ASTM A320/A320M, Specification for Alloy-Steel and Stainless Steel Bolting Materials for Low-Temperature Service.
9. ASTM A384/A384M-02 Standard Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies.
10. ASTM A500, Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
11. ASTM A572/A572M, Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
12. ASTM A793, Specification for Rolled Floor Plate, Stainless Steel.
13. ASTM A992/A992M, Specification for Structural Steel Shapes.
14. ASTM B209, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
15. ASTM B211, Specification for Aluminum and Aluminum-Alloy Bar, Rod and Wire.
16. ASTM B221, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
17. ASTM B308/B308M, Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
18. ASTM B429, Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
19. ASTM B632/B632M, Specification for Aluminum-Alloy Rolled Tread Plate.
20. AWS D1.1/D1.1M, Structural Welding Code – Steel.
21. AWS D1.2/D1.2M, Structural Welding Code – Aluminum.
22. AWS D1.6, Structural Welding Code – Stainless Steel.
23. NAAMM, Metal Finishes Manual.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Welding:
      a. Qualify welding processes and welding operators in accordance with AWS D1.1/D1.1M, D1.2/D1.2M, or D1.6, as applicable.
      b. When requested by ENGINEER, provide certification that each welder employed on or to be employed for the Work have satisfactorily passed AWS qualification tests within previous 12 months. Ensure that all certifications are current.

B. Regulatory Requirements: Conform to the following:
   1. 29 CFR 1910, Occupational Health and Safety Standards.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Fabrication and erection details for assemblies of miscellaneous metal Work. Include plans, elevations, and details of sections and connections. Show anchorage and accessory items. Include setting drawings and templates for locating and installing miscellaneous metal items and anchorage devices.
   2. Product Data:
      a. Copies of manufacturer's specifications, load tables, dimension diagrams, anchor details, and installation instructions for products to be used in miscellaneous metal Work.
   3. Samples:
      a. Sets of representative Samples of materials including nosings, rungs, and other finished products as requested by ENGINEER. ENGINEER's review will be for color, texture, style, and finish only. Compliance with other requirements is exclusive responsibility of CONTRACTOR.

B. Informational Submittals: Submit the following:
   1. Test and Evaluation Reports:
      a. Mill test report that indicate chemical and physical properties of each type of material, when requested by ENGINEER.
   2. Qualifications Statements:
      a. Copies of welder's certifications, when requested by ENGINEER.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling and Unloading:
   1. Deliver products to Site to ensure uninterrupted progress of the Work. Deliver anchorage materials to be embedded in other construction in ample time to prevent delaying the Work.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Steel:
   1. W-Shapes and WT-Shapes: ASTM A992/A992M.
   2. S-Shapes and Channels: ASTM A572/A572M, Grade 50.
   3. Hollow Structural Sections: ASTM A500, Grade B.
   4. Angles, Plates, Bars: ASTM A36/A36M.
   5. Steel Pipe: ASTM A53/A53M, Grade B.

B. Aluminum:
   1. Aluminum Shapes: ASTM B308/B308M, Alloy 6061-T6, ASTM B 221, Alloy 6061-T6.
   2. Aluminum Tubes and Pipes: ASTM B429, Alloy 6061-T6.
   3. Aluminum Bars and Rod: ASTM B211, Alloy 6061-T6.
   4. Aluminum Plates: ASTM B209, Alloy 6061-T6.

C. Stainless Steel:
   1. Plates and Sheets: ASTM A240/A240M, Type 304L or Type 316 stainless steel.
   2. Submerged or Intermittently Submerged: Type 316 stainless steel.
   3. Non-submerged: Type 304L stainless steel.

D. Stainless Steel Fasteners and Fittings: ASTM A 320/A 320M, Type 304L or Type 316 Stainless Steel.

E. Zinc-coated Hardware: ASTM A153/A153M.

2.2 MISCELLANEOUS METAL ITEMS

A. Shop Assembly:
   1. Pre-assemble items in the shop to the greatest extent possible to minimize field-splicing and field-assembly of units at the Site. Disassemble units only to extent necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Aluminum Ladders:
   1. Fabricate ladders for locations shown or indicated with dimensions, spacing, details, and anchorages as shown and specified. Comply with OSHA 29 CFR 1910 and ANSI A14.3, except as otherwise shown or specified.
      a. Unless otherwise shown, provide 1.5-inch diameter continuous side rails, spaced at least 1.5 feet apart.
      b. Provide extruded square rungs, spaced maximum of 12 inches on centers, with non-slip surface on top of each rung. Adhesive strips for non-slip surfaces are not acceptable.
   2. Fit rungs in centerline of side rails, plug weld, and grind smooth on outer rail faces.
   3. Support each ladder at top and bottom and at intermediate points spaced not more than five feet on centers.
   4. Use welded or bolted brackets, designed for adequate support and anchorage, and to hold ladder clear of wall surface with minimum of seven inches between wall and centerline of rungs.
   5. Unless otherwise shown or approved by ENGINEER, extend rails 3.5 feet above top rung, and return rails to wall or structure, unless other secure handholds are provided. If adjacent structure does not extend above top rung, goose-neck extended rails back to structure to provide secure ladder access.
   6. Use extruded aluminum conforming to alloy and temper 6061-T6.

C. Aluminum Ladder Safety Cages:
   1. Fabricate ladder safety cages from extruded flat bars, assembled by welding.
   2. Unless otherwise shown or indicated, provide 1/2-inch by three-inch top, bottom and intermediate hoops spaced not more than five feet on centers; and 3/8-inch by two-inch vertical bars, secured to each hoop.
   3. Space vertical bars approximately nine inches on centers.
   4. Fasten assembled safety cage to ladder rails and adjacent construction as shown or indicated.
   5. Grind welds, sharp edges, and projections smooth.
   6. Comply with OSHA 29 CFR 1910 and ANSI A14.3.
   7. Use extruded aluminum conforming to alloy and temper 6061-T6.

D. Steel Lintels:
   1. Provide loose structural steel lintels for openings and recesses in masonry walls and brick walls as specified or as shown.
   2. Weld adjoining members together to form a single unit, where shown or indicated.
   3. Provide not less than eight inches bearing at each side of openings, unless otherwise shown.
   4. Steel lintels to be installed in exterior walls shall be hot-dip galvanized and finish painted. Other steel lintels shall be painted.
   5. Surface preparation and painting shall conform to Section 09 91 00, Painting.
   6. Where lintels are not shown on the Drawings, provide lintels as specified in the following table. Provide other lintels where shown and of size indicated on the Drawings.

Clear Span (Max)	**Exterior Angle**	**Interior Angles (typical 8-inch wall)**
4.0 feet	3.5 inches by 3.5 inches by 5/16 inches	Two 3.5 inches by 3.5 inches by 5/16 inches
6.0 feet	Four inches by 3.5-inches by 5/16 inches	Two 4 inches by 3.5 inches by 5/16 inches
8.0 feet	Five inches by 3.5 inches by 5/16 inches	Two 5 inches by 3.5 inches by 5/16 inches

E. Shelf Angles:
   1. Provide structural steel shelf angles of sizes shown, for attachment to concrete or masonry construction. Provide slotted holes to receive 3/4-inch bolts, spaced not more than six inches from ends and not more than 2.0 feet on centers, unless otherwise shown.
      a. Provide galvanized shelf angles on outdoor construction.
   2. Provide wedge-type concrete inserts, complete with fasteners, for attachment of shelf angles to cast-in-place concrete.

F. Steel Stair Nosings:
   1. Provide nosings fabricated of structural steel shapes as shown, of all-welded construction with mitered corners and continuously welded joints.

2. Provide anchors welded to nosings for embedding in concrete or masonry, spaced not more than six inches from each end, six inches from corners, and 2.0 feet on centers, unless otherwise shown.
    a. Galvanize all nosings.

G. Aluminum Stair Nosings:
1. Manufacturers: Provide products of one of the following:
    a. Supergrit Type 241BF by Wooster Products, Inc.
    b. Or equal.
2. Fabricate extruded aluminum nosing of sizes and configurations as shown on the Drawings.
    a. Unless otherwise shown, provide ribbed abrasive filled type, using black abrasive filler.
3. Provide anchors for embedding in concrete, either integral or applied to treads, as standard with manufacturer.

H. Wheel Guards:
1. Manufacturers: Provide products of one of the following:
    a. R-4986-DG, by Neenah Foundry Company.
    b. Or equal.
2. Provide bolted-type wheel guards, 3/4-inch thick minimum, of hollow core gray iron casting, and of size and shape as shown.
3. Provide holes for countersunk anchorage devices and grouting.
4. Anchor wheel guards to concrete or masonry construction in compliance with manufacturer's instructions.
5. Fill cores solidly, using grout as specified in Section 03 60 00, Grouting.
6. Armored-concrete type wheel guards are not acceptable.

I. Fall Prevention System:
1. Provide each ladder with a fall prevention system complying with 29 CFR 1910, ANSI A14.3, and ANSI Z359.1.
2. System shall consist of a carrier rail securely and permanently attached to ladder, over which travels a sleeve to which harness belt can be attached.
3. Products and Manufacturers: Provide products of one of the following:
    a. Saf-T-Climb by North Safety Products.
    b. Or equal.
4. Rail:
    a. Notched at six-inch intervals and constructed of galvanized steel.
    b. Provide ladder attachments/rail mounting brackets of same material as rail, and as required by Supplier.
    c. For all ladders, include provisions to secure safety sleeve to carrier rail at top of vertical ladder so that sleeve will not slide down rail when safety belt is unsnapped.
    d. Ladders Below Hatches: Rail for ladder shall extend from bottom of ladder to top of ladder. Provide telescoping safety post as specified in this Article.

e. Ladders Not Below Hatches: Rail for ladder shall extend from bottom of ladder to above horizontal landing or roof at top of ladder, Provide removable extension section at top of ladder. Arrange rail to allow climber to land on landing or roof without unsnapping climber's safety harness.

5. Accessories: Provide with each ladder the following, all furnished by fall prevention system Supplier:
   a. One safety sleeve compatible for use with the rail. Sleeve shall be cast bronze with five zinc-plated steel roller bearings. Sleeve shall travel smoothly on straight or curved rail.
   b. One safety harness that attaches to sleeve. Harness shall be of woven, high-strength nylon, with padded straps and forged steel buckles and rings. Harness shall distribute impact forces of a fall over climber's thighs, buttocks, chest, and shoulders.
   c. One shock-adsorbing Y-lanyard no longer than six feet, complying with ANSI Z359.1. Lanyard shall be 5/8-inch diameter nylon rope with double-locking snap hooks at each end.

J. Safety Post:
1. Provide safety post for each fixed access ladder located below an access hatch. Safety post shall be manufactured of high-strength structural material with telescoping tubular section that locks automatically when fully extended.
2. Products and Manufacturers: Provide products of one of the following:
   a. LadderUP Safety Post by Bilco Company
   b. Or equal.
3. Use upward and downward movement of post shall be controlled by stainless steel spring balancing mechanism.
4. Safety post shall be hot-dip galvanized steel.

K. Manhole Steps:
1. Provide manhole steps as shown. Conform to requirements of 29 CFR 1910 and ANSI A14.3.
2. Products and Manufacturers: Provide one of the following:
   a. R-1982-W, manufactured by Neenah Foundry Company.
   b. Or equal.
3. Vertical separation of steps shall be uniform at maximum of 12 inches on centers. Steps shall project evenly from manhole or chamber walls.
4. Material: Extruded aluminum.

L. Bollards:
1. Provide Schedule 80 galvanized steel pipe filled with concrete as shown on the Drawings. Paint as required in accordance ith Section 09 91 00, Painting. Unless otherwise shown or specified, finish-paint bollard "Safety Yellow."

M. Miscellaneous Framing and Supports:
   1. Provide miscellaneous metal framing and supports that are not part of structural steel framework and are required to complete the Work.
   2. Fabricate miscellaneous units to sizes, shapes, and profiles shown on the Drawings or, if not shown, of required dimensions to receive adjacent grating, plates, tanks, doors, and other work to be retained by the framing.
   3. Except as otherwise shown, fabricate from structural shapes, plates, and bars, of all-welded construction using mitered corners, welded brackets, and splice plates and minimum number of joints for field connection.
   4. Cut, drill, and tap units to receive hardware and similar items to be anchored to the Work.
   5. Furnish units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units are to be installed after concrete is placed.
      a. Except as otherwise shown, space anchors, 2.0 feet on centers, and provide units the equivalent of 1.25-inch by 1/4-inch by eight-inch strips.
      b. Galvanize exterior miscellaneous frames and supports.
      c. Where shown or indicated, galvanize miscellaneous frames and supports that are not to be installed outdoors.
   6. Miscellaneous steel framing and supports shall be hot-dip galvanized and finish-painted, unless otherwise shown or indicated.
   7. For railings, refer to Section 05 52 15, Aluminum Handrails and Railing.
   8. Surface preparation and painting of galvanized surface shall conform to Section 09 91 00, Painting

N. Fasteners and Hardware: Provide Type 316 stainless steel fasteners for aluminum fabrications and zinc-coated hardware for galvanized fabrications, unless otherwise shown or specified.

O. Anchors and Expansion Anchors: Refer to Section 05 05 33, Anchor Systems.

2.3 FINISHING

A. Surface Preparation and Shop Priming: Perform surface preparation and apply primer coat to miscellaneous metal fabrications in the shop. Conform to surface preparation and shop priming requirements in Section 09 91 00, Painting.

B. Galvanizing:
   1. Galvanizing of fabricated steel items shall comply with ASTM A123/A123M.
   2. Details of fabrication of steel items and assemblies to be hot-dip galvanized shall conform to recommendations of ASTM A384/A384M to minimize the potential for distortion.

C. Aluminum Finish: Provide natural mill finish for aluminum Work unless otherwise shown or specified.

2.4 SOURCE QUALITY CONTROL

A. Tests and Inspections:
   1. Materials and fabrication procedures shall be subject to inspection and tests in the mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve CONTRACTOR of responsibility for providing materials and fabrication procedures complying with the Contract Documents.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine conditions under which the Work is to be performed and notify ENGINEER in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install miscellaneous metal fabrications accurately in location, alignment, and elevation, plumb, level, true, and free of rack, measured from established lines and levels. Brace temporarily or anchor temporarily in formwork where fabrications are to be built into concrete, masonry, or other construction.

B. Anchor securely as shown and as required for the intended use, using concealed anchors where possible.

C. Fit exposed connections accurately together to form tight, hairline joints. Field-weld steel connections that are not to be exposed joints and cannot be shop-welded because of shipping size limitations. Comply with AWS D1.1/D1.1M, D1.2/D1.2M and D1.6, as applicable to the material being welded. Grind steel joints smooth and touch-up shop paint coat. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

D. Protection of Aluminum from Dissimilar Materials:
   1. Coat surfaces of aluminum that will contact dissimilar materials such as concrete, masonry, and steel, in accordance with Section 09 91 00, Painting.

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SECTION 05 51 17

ALUMINUM STAIRS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to design, furnish and install aluminum stairs including surface preparation and shop priming.
   2. The extent of aluminum stairs shall be as shown.
   3. The Work also includes:
      a. Providing openings in and attachments to aluminum stairs to accommodate the Work under this and other Sections and providing for the aluminum stairs all items such as anchor bolts, studs and all items required for which provision is not specifically included under other Sections.
      b. Providing openings in and attachments to aluminum stairs to accommodate the work under other contracts, and assisting other contractors in building on or attaching to the aluminum stairs all items such as anchor bolts, studs and all items required for which provision is not specifically included under other contracts.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before the aluminum stairs Work.
   2. Notify other contractors in advance of the installation of the aluminum stairs to provide them with sufficient time for the installation of items included in their contracts that must be installed with, or before, the aluminum stairs Work.

C. Related Sections:
   1. Section 05 05 33, Anchor Systems.
   2. Section 05 52 15, Aluminum Handrails and Railings.
   3. Section 09 91 00, Painting.
   4. Section 40 05 96, Vibration, Seismic, and Wind Controls.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. Aluminum Association (AA), Specification for Aluminum Structures.
   2. American Society for Testing and Materials, (ASTM).
      a. ASTM B 209, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

b. ASTM B 211, Specification for Aluminum and Aluminum-Alloy Bar, Rod and Wire.
c. ASTM B 221, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
d. ASTM B 308/B 308M, Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
e. ASTM B 429, Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
f. ASTM F 593, Specification for Stainless Steel Bolts, Hex Cap Screws and Studs.
g. ASTM F 594, Specification for Stainless Steel Nuts.

3. American Welding Society, (AWS).
   a. AWS D1.2/D1.2M, Structural Welding Code-Aluminum.
4. National Association of Architectural Metal Manufacturers, (NAAMM).
   a. NAAMM, Metal Stairs Manual and Metal Finishes Manual.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications:
   1. Manufacturer shall have a minimum of five years experience producing substantially similar equipment and shall be able to show evidence of at least five installations each in satisfactory operation for at least five years.

B. Component Supply and Compatibility:
   1. Obtain all products included in this Section regardless of the component manufacturer from a single pre-engineered aluminum stair manufacturer.
   2. The pre-engineered aluminum stair manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
   3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the pre-engineered aluminum stair manufacturer.

C. Codes: Comply with the applicable requirements of the state and local building codes.

D. Source Quality Control: CONTRACTOR shall be responsible for entire design, fabrication and installation of pre-engineered aluminum stair Work.

E. Delegated Design: Shop Drawings and calculations shall be prepared by a Registered Professional Engineer licensed in the State in which the pre-engineered aluminum stairs will be installed and is a recognized expert in the type of Work shown and specified.

F. The Work shall comply with seismic requirements in Section 40 05 96, Vibration, Seismic, and Wind Controls.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Samples:
      a. Representative samples of materials including nosings, tread material, and others items as requested by the ENGINEER. Review will be for type only. Compliance with all other requirements is exclusive responsibility of CONTRACTOR.
   2. Shop Drawings:
      a. Erection and detailed Shop Drawings, which show the plan location, elevation and details for the fabrication and erection of the aluminum stair Work. Show anchorage and accessory items. Include details of all connections between all materials.
   3. Delegated Design Submittals:
      a. Provide signed and sealed Shop Drawings and calculations, which are prepared by a Registered Professional Engineer licensed in the State in which the aluminum stairs will be installed.
      b. Provide certification by professional engineer that design of aluminum stairs was performed in accordance with performance and design criteria stated in the Contract Documents, and that design complies with Laws and Regulations and prevailing standards of practice.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:
   1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices which are to be embedded in cast-in-place concrete in ample time to prevent delay of that Work.

B. Storage and Protection:
   1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect materials from corrosion and deterioration.

C. Acceptance at Site:
   1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify ENGINEER, in writing, if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

A. Pre-engineered aluminum stairs shall comply with the requirements of the NAAMM, "Metal Stairs Manual".

B. Sizes of miscellaneous items such as carrier angles and platform stiffeners, and design stresses shall be as recommended in Section 4 of the "Metal Stairs Manual", unless otherwise shown.

C. All required stair loadings and other stair related requirements shall comply with the governing building code in which the pre-engineered aluminum stairs will be installed.

2.2 FABRICATION

A. General:
   1. Use welding for joining pieces together, unless otherwise shown or specified. Welding to comply with the applicable provisions of AWS D1.2/D1.2M. Fabricate units so that bolts and other fastenings do not appear on finish surfaces. Make joints true and tight, and make connections between parts light-proof tight. Provide continuous welds, ground smooth where exposed.
   2. Construct stair units to conform to sizes and arrangements as shown. Provide pre-engineered aluminum framing, hangers, columns, struts, clips, brackets, bearing plates and other components for the support of pre-engineered aluminum stairs and platforms. Erect pre-engineered aluminum stair Work to line, plumb, square, and true with runs registering level with floor and platform levels.
   3. Provide brackets and bearing surfaces as detailed and as required to anchor and contain the pre-engineered aluminum stairs on the supporting structure.
   4. Finish: Provide Architectural mill finish as specified in the NAAMM Manual.
   5. Protection of Aluminum from Dissimilar Materials: Coat all surfaces of aluminum in contact with dissimilar materials, such as concrete, masonry and steel as specified in Section 09 91 00, Painting

B. Stair Framing:
   1. Fabricate stringers of structural aluminum channels, or plates, or a combination thereof. Provide closures for exposed ends of stringers.
   2. Construct platforms of structural aluminum channel headers and miscellaneous framing members. Bolt or weld headers to stringers. Bolt or weld framing members to stringers and headers.

C. Aluminum Grating Treads and Platforms:
   1. Stair Tread Design Loads: Concentrated live load shall be:
      a. 300 pounds on front-most five inches of tread at center of tread of span up to 5.5 feet.
      b. 300 pounds on front-most five inches of tread at the one-third points of tread of span greater than 5.5 feet.
   2. Maximum Clear Span Deflection for Concentrated Live Loads: 1/240 of span, but not more than 1/4-inch.
   3. Maximum Fiber Stress: 12,000 psi.
   4. Minimum Size of Members:
      a. Minimum size of bearing bars shall be within standard mill tolerance as

indicated in load tables in NAAMM MBG 531 for applicable loading and deflection requirements.

b. Minimum dimensions of cross bars shall be as indicated in tables of Minimum Standard Cross Bars and Connecting Bars in NAAMM MBG 531.

5. Carrier plate shall be 1/4-inch thick minimum. Top of carrier plate shall be flush with top of tread, unless otherwise shown or indicated. Provide carrier plate with hole and slot for attachment to stringer.
6. Comply with requirements of AA Aluminum Design Manual.
7. Fabricate grating treads with abrasive nosing on one edge and with aluminum angle or aluminum plate carrier at each end for stringer connections. Secure treads to stringers with bolts.
8. Fabricate grating platforms, with nosing matching that on grating treads, at all landings. Provide toe-plates at open-sided edges of floor grating fastened to platform framing members.

D. Stair Aluminum Railing:
1. Aluminum railings shall conform to the requirements of Section 05 52 15, Aluminum Handrails and Railings.

PART 3 – EXECUTION

3.1 INSPECTION

A. CONTRACTOR shall examine the conditions under which the Work is to be installed and notify the ENGINEER, in writing, of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide concrete inserts, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction.

3.3 INSTALLATION

A. Fastening to In-Place Construction:
1. Provide anchorage devices and fasteners where necessary for securing pre-engineered aluminum stairs to in-place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through bolts and other connectors as required. The anchorage devices and fasteners shall be Type 316 stainless steel.

B. Cutting, Fitting and Placement:

1. Perform cutting, drilling and fitting required for the installation of the pre-engineered aluminum stairs. Set the pre-engineered aluminum stairs accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry or similar construction.
2. Fit exposed connections accurately together to form tight hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations.

++ END OF SECTION ++

SECTION 05 52 15

ALUMINUM HANDRAILS AND RAILINGS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to furnish and install aluminum handrail and railing systems. The Work also includes:
      a. Providing openings in, and attachments to, aluminum handrail and railing systems to accommodate the Work under this and other Specification Sections. Provide all items for aluminum handrails and railings, including anchorages, fasteners, studs, and other items required for which provision for is not specifically included under other Sections.
      b. Provide openings in and attachments to aluminum handrails and railings to accommodate work under other contracts. Assist other contractors in building on or attaching to aluminum handrails and railings all items such as fasteners and other items required for which provision is not specifically included under other contracts.
   2. Aluminum handrails and railings Work shall include components and features shown and specified, and all components and features available from specified manufacturers required for providing complete aluminum handrail and railing system in accordance with the Contract Documents.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before aluminum handrails and railings Work.
   2. Notify other contractors in advance of installing aluminum handrail and railings to provide them with sufficient time to install items included in their contracts that are to be installed with or before aluminum handrails and railings Work.
   3. Aluminum handrail and railing locations shall conform to Laws and Regulations.

C. Related Sections:
   1. Section 01 33 00, Submittal Procedures.
   2. Section 01 65 00, Product Delivery Requirements.
   3. Section 01 66 00, Product Storage and Handling Requirements.
   4. Section 05 05 33, Anchor Systems.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. Aluminum Association (AA), Aluminum Design Manual.
   2. ASTM B26/B26M, Specification for Aluminum-Alloy Sand Castings.
   3. ASTM B117, Standard Practice for Operating Salt Spray (Fog) Apparatus.
   4. ASTM B136, Standard Method for Measurement of Stain Resistance of Anodic Coatings on Aluminum.
   5. ASTM B137, Standard Test Method for Measurement of Coating Mass per Unit Area on Anodically Coated Aluminum.
   6. ASTM B221, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
   7. ASTM B241/B241M, Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.
   8. ASTM B244, Standard Test Method for Measurement of Thickness of Anodic Coatings on Aluminum and of Other Nonconductive Coatings on Nonmagnetic Basis Metals with Eddy-Current Instruments.
   9. ASTM B247, Specification for Aluminum and Aluminum-Alloy Die Forgings, Hand Forgings, and rolled Ring Forgings.
   10. ASTM B429, Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
   11. ASTM E 935, Standard Test Methods for Permanent Metal Railing Systems and Rails for Buildings.
   12. NAAMM/Architectural Metal Products Division (AMP), Pipe Railing Manual.
   13. NAAMM/AMP AMP 501 Finishes for Aluminum.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer:
      a. Manufacturer shall be able to document at least five years successful experience in fabricating aluminum handrail and railing systems of scope and type similar to that required.
      b. Manufacturer shall be able to capable of providing custom detail drawings for the products required.
   2. Professional Engineer:
      a. CONTRACTOR or handrail and railing manufacturer shall retain a registered professional engineer legally qualified to practice in same state as the Site. Professional engineer shall have at least five years experience designing aluminum handrails and railings.
      b. Responsibilities include:
         1) Reviewing aluminum handrail and railing system performance and design criteria stated in the Contract Documents.
         2) Preparing written requests for clarifications or interpretations of performance or design criteria for submittal to ENGINEER by CONTRACTOR.

3) Preparing or supervising preparation of design calculations verifying compliance of aluminum handrail and railing system with requirements of the Contract Documents.
4) Signing and sealing all calculations.
5) Certifying that:
   a) Design of aluminum handrail and railing system was performed in accordance with performance and design criteria stated in the Contract Documents, and
   b) Design conforms to all applicable local, state, and federal Laws and Regulations, and to prevailing standards of practice.

3. Installer Qualifications:
   a. Retain a single installer trained and with record of successful experience in installing aluminum handrail and railing systems.
   b. Installer shall have record of successfully installing aluminum handrail and railing systems in accordance with recommendations and requirements of manufacturer, or shall provide evidence of being acceptable to the manufacturer.
   c. Installer shall employ only tradesmen with specific skill and successful experience in the type of Work required.
   d. When requested by ENGINEER, submit name and qualifications of installer with the following information for at least three successful, completed projects:
      1) Names and telephone numbers of owner and architect or engineer responsible for each project.
      2) Approximate contract cost of the aluminum handrail and railing systems for which installer was responsible.
      3) Amount (linear feet) of aluminum handrail and railing installed.

B. Component Supply and Compatibility:
   1. Obtain all products included in this Section regardless of component manufacturer, from a single aluminum handrail and railing system manufacturer.
   2. Aluminum handrail and railing system manufacturer shall review and approve or prepare all Shop Drawings and other submittals (except for delegated design submittals, when professional engineer is retained by other than handrail and railing manufacturer) for all components furnished under this Section.
   3. Components shall be specifically constructed for specified service conditions and shall be integrated into overall assembly by aluminum handrails and railings manufacturer.

C. Regulatory Requirements: Conform to Laws and Regulations including:
   1. OSHA Part 1910.23, Guarding Floor and Wall Openings and Holes.

D. Certifications:

1. Furnish certification, signed by authorized officer of manufacturer and notarized, stating that handrail and railing systems conform to the design prepared by the professional engineer.
2. Furnish certification, signed by authorized officer of CONTRATOR and notarized, stating that all components and fittings are furnished by the same manufacturer.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Drawings for fabrication and installation of aluminum handrail and railing systems with sizes of members, pipe wall thickness, information on components, and anchorage devices. Show all anchorages. Provide details drawn at scale of 1.5-inch equal to one foot.
      b. Indicate required location of posts.
      c. Indicate locations and details of all expansion joints, if any.
      d. Indicate locations and details of gaps across seismic joints, if any.
      e. Profile drawings of aluminum handrail and railing system components.
      f. Custom detail drawings. Details of forming, jointing, sections, connections, internal supports, trim and accessories. Provide details drawn at scale of 1.5-inch equal to one foot.
   2. Product Data:
      a. Manufacturer's specifications, standard detail drawings, and installation instructions for aluminum handrail and railing systems.
      b. Manufacturer's catalogs showing complete selection of standard and custom components and miscellaneous accessories for selection by ENGINEER.
   3. Delegated Design Submittals:
      a. Design Data:
         1) Design computations or complete structural analysis of handrail and railing systems, signed and sealed by professional engineer. Professional Engineer's seal shall be clearly legible, including state of registration, registration number, and name on seal.
         2) Certification by professional engineer that professional engineer has performed design of aluminum handrail and railing systems in accordance with performance and design criteria stated in the Contract Documents, and that design conforms to all local, state, and federal Laws and Regulations, and to prevailing standards of practice.
   4. Samples:
      a. Full-size Sample, 2.0 feet long, of assembled railing system at post and rail intersections. Sample shall have all associated components including typical connections, mounted toeboard and sleeve, and handrail at wall return, complete with mounting brackets, all with specified controlled uniform metal finish.

b. Color Samples: Maximum range of clear anodized aluminum that shall appear in finished Work. Prepare range Samples, to show highest level of color control feasible for actual handrail and railing systems, as determined by licensor of finishing process specified, on actual extrusions and castings of the Work.

c. Samples will be reviewed for finish, color, joint tolerances, workmanship, and general component assembly only. Compliance with other requirements is the responsibility of the CONTRACTOR.

5. Test Procedure: Submit detailed description of proposed shop testing procedures. Do not perform shop testing until ENGINEER approves shop test procedure:

B. Informational Submittals: Submit the following:

1. Certificates:

a. Certification on source of supply, as specified in Article 1.3 of this Section.

b. Manufacturer certification specified in Article 1.3 of this Section.

2. Source Quality Control Submittals:

a. Manufacturer's load testing report in accordance with ASTM E935 for completed aluminum handrail and railing systems, demonstrating compliance with applicable requirements of building codes, safety codes, and other Laws and Regulations.

3. Qualifications Statements: Submit qualifications for the following:

a. Manufacturer, when requested by ENGINEER.

b. Professional engineer.

c. Installer, when requested by ENGINEER. Qualifications statement shall include record of experience with references specified.

C. Closeout Submittals: Submit the following:

1. Maintenance Manuals: Furnish detailed maintenance manuals that include the following:

a. Product name and number.

b. Detailed procedures for routine maintenance and cleaning, including cleaning materials, application methods and precautions in use of products that may be detrimental to finish when improperly applied.

c. Handrail and railings systems manufacturer's current catalog including individual parts.

d. Conform to Section 01 78 23, Operations and Maintenance Data.

2. Guarantee: Provide in maintenance manual the guarantee specified.

D. Maintenance Material Submittals: Submit the following:

1. Extra Stock Materials:

a. After completing installation, deliver to OWNER two of each fitting used in the Work and 50 feet of handrail.

b. Label each piece or sealed container with name and product number.

c. Conform to Section 01 78 43, Spare Parts and Extra Materials.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, and Unloading:
   1. Prior to shipping, completely inspect products to assure that components are complete and comply with requirements of Contract Documents and recommendations of manufacturer. Box or crate products as required to prevent damage during shipment.
   2. Deliver products to Site to ensure uninterrupted progress of the Work. Deliver anchorage products that are to be embedded in concrete in ample time to prevent delaying the Work.
   3. Inspect all boxes, crates, and packages upon delivery to Site and notify ENGINEER in writing of loss or damage to products. Promptly remedy loss and damage to new condition per manufacturer's instructions.
   4. Conform to Section 01 65 00, Product Delivery Requirements.

B. Storage and Protection:
   1. Keep products off ground using pallets, platforms, or other supports. Protect products from corrosion and deterioration.
   2. Conform to Section 01 66 00, Product Storage and Handling Requirements.

C. Handling of Products:
   1. Do not subject handrail and railing products to bending or stress.
   2. Do not damage edges or handle products in a manner that will cause scratches, warping, or dents.
   3. Protect handrails and railings by paper or coating as acceptable to handrail and railing manufacturer, against scratching, splashes of mortar, paint, and other marring during transportation, handling, and erection. Protect until completion of adjacent work.

1.6 GUARANTEE

A. Guarantee: Manufacturer shall provide written guarantee of availability of replacement parts and components for period of at least five years after completion of the Project.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. System Description: Aluminum handrail and railing system shall consist of equally spaced horizontal rails with totally concealed mechanical fasteners, internally threaded tubular rivets and components fastened to posts spaced no more than 5.0 feet on centers and system of handrails supported from adjacent construction by mounting brackets spaced at no more than 5.0 feet on centers.

B. Design Criteria and Performance Criteria:
   1. Design, fabricate, and install aluminum handrail and railing systems to withstand the most critical effects resulting from the following loads (loads listed below do not act concurrently):
      a. Uniform Load: 50 pounds per foot, applied at top in any direction.
      b. Concentrated Load: 200 pounds single load, applied at any point along the top in any direction.
      c. Components: Intermediate rails (all rails except the handrail), balusters, and panel fillers, if any, shall withstand horizontally-applied normal load of 50 pounds on an area equal to one square foot, including openings and space between rails. Reactions due to this loading are not required to be superimposed to loading specified for main supporting members of handrails and railings.
      d. Conform to requirements of AA Aluminum Design Manual for determining allowable stresses and safety factors for aluminum structural components.
      e. Limit deflection in each single span of railing and handrail to 1.5-inch maximum, and to 1.4-inch maximum on railing posts. Applied loads shall not produce permanent deflection in the completed Work when loads are removed.
   2. Thermal Control: Provide adequate expansion within fabricated systems that allows for thermal expansion and contraction caused by material temperature change of 140 degrees F to -20 degrees F without warp or bow of system components. Distance between expansion joints shall be based on providing 1/4-inch wide joint at 70 degrees F, which accommodates movement of 150 percent of calculated amount of movement for specified temperature range.
   3. Where handrail and railing systems cross expansion joints in the building or structure, provide expansion joints in handrail and railings systems.
   4. For posts located at or near end of runs as shown, uniformly space intermediate posts as required to conform to loading and deflection criteria specified, at intervals no greater than maximum post spacing specified. Where posts are shown for handrails along both sides of walkways and other similar locations, locate posts opposite each other; do not stagger post locations.

2.2 MANUFACTURERS

A. Products and Manufacturers: Provide one of the following:
   1. Custom Fabricated Connectorail System by Julius Blum & Company, Inc.
   2. Custom Fabricated Series 500 Non-Welded Aluminum Pipe Aluminum handrails and railing systems by Superior Aluminum Products, Inc.
   3. Or Equal.

2.3 MATERIALS

A. Extruded Aluminum Architectural and Ornamental Shapes: ASTM B221, Alloy 6063-T52.

B. Aluminum Forgings: ASTM B247.

C. Extruded or Drawn Aluminum Pipe and Tube:
   1. ASTM B429 or ASTM B241/B241M, Alloy 6063-T5, 6063-T52, or 6063-T832 as required by loadings, deflections, and post spacing specified.
   2. Provide Schedule 40 pipe, minimum, unless conditions of detail and fabrication require extra-heavy pipe to comply with Specifications. Rails and posts shall have minimum outside diameter of 1.90 inches.

D. Reinforcing Bars: Solid, circular profile, 24 inches long, 6061-T6 aluminum reinforcing bars with same outside diameter as inside diameter of post.

E. Anchors and Fastenings:
   1. For anchors and fasteners, use Type 316 stainless steel; minimum 0.5-inch diameter.
   2. Provide minimum of four bolt fasteners per post where surface-mounted posts are shown. Components shall be in accordance with manufacturer's recommendations and as approved or accepted (as applicable) by ENGINEER on submittals.
   3. Anchors: As specified in Section 05 05 33, Anchor Systems.
   4. Base plates mounted to concrete shall incorporate corrosion protection.

F. Castings:
   1. Provide high-strength aluminum alloy brackets, flanges, and fittings suitable for anodizing as specified.
   2. Aluminum alloy sand castings: ASTM B26/B26M.

G. Connector Sleeves: Schedule 40, 5.0-inch long by 1.610-inch diameter.

H. Chain, Snaps, and Eye Bolts: Provide oblong 0.250-inch welded link, Type 316 stainless steel chain weighing 57 pounds per cubic foot, each link 1.25-inch by 7/16-inch. Provide Type 316 stainless steel eyebolts, 1/4-inch stainless steel threaded quick links and heavy-duty swivel snaps with spring loaded latch.

I. Gates: For each gate in handrail or railing system, provide the following:
   1. Hinges: Two-self closing aluminum hinges.
   2. Latches and Stops: One latch and stop with rubber bumper and one-inch diameter plastic knobs.

J. Custom Cover Flanges: 1/4-inch high by 4.0-inch diameter, aluminum.

K. Adhesive: Two-part waterproof epoxy-type as recommended by handrail and railing systems manufacturer.

L. Non-shrink Grout: Refer to Section 03 60 00, Grouting.

M. Toeboards:
   1. Provide extruded Alloy 6063-T5 or T52 aluminum alloy toeboards, unless railing is mounted on curbs or other construction of sufficient height and type to conform to OSHA 1910.23. Bars or plates are not acceptable.
   2. Unless otherwise specified, toeboards shall conform to requirements of OSHA 1910.23, Section (e).

N. System Components and Miscellaneous Accessories: Provide complete selection of manufacturer's standard and custom aluminum handrail and railing systems components and miscellaneous accessories required. Show type and location of all such items on Shop Drawings and other submittals as applicable.

2.4 FABRICATION

A. General: Unless otherwise shown or specified, provide typical non-welded construction details and fabrication techniques recommended in NAAMM/AMP Pipe Railing Manual and NAAMM/AMP AMP 501.

B. Fabricate handrail and railing systems true to line and level, with accurate angles surfaces and straight edges. Fabricate corners without using fittings. Provide bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work. Form elbow bends and wall returns to uniform radius, free from buckles and twists, with smooth finished surfaces, or use prefabricated bends. Provide not less than four-inch outside radius.

C. Provide chains across openings in railings where shown. Attach one end of each chain to an eyebolt in post and other end attached by means of swivel eye snap hook to similar eyebolt in opposite post.

D. Remove burrs from exposed edges.

E. Close aluminum pipe ends by using prefabricated fittings.

F. Weep Holes:
   1. Fabricate joints that will be exposed to weather to exclude water.
   2. Provide 15/64-inch diameter weep holes at lowest possible point on each post in handrail and railing systems.
   3. Provide pressure relief holes at closed ends of handrail and railing systems.

G. Toeboards:
   1. Provide manufacturer's standard toeboard, which accommodates movement caused by thermal change specified without warping or bowing toeboards.
   2. Provide manufacturer's standard toeboard, which accommodates storage for removable socket covers.

3. Coordinate and cope toeboard as required to accommodate cover flanges at posts.
4. Toeboards shall follow curvature of railing. Where railing is shown to have curved contours at corners, or other locations, toeboard shall likewise be curved to follow line of railing system.

H. Reinforcing Bars: Provide reinforcing bar friction-fitted at each post in railing system. Extend reinforcing bars of tubes six inches into cast-in-place sleeves or other types of supporting brackets.

I. Mechanically Fitted Component Pipe Handrail and Railing System:
1. Use non-welded pipe handrail and railing system with posts, top and intermediate rail(s), and flush joints.
2. Provide top and two intermediate horizontal rail(s), equally spaced.
3. Do not use blind rivets, pop rivets, or other exposed fastening devices in the Work. Fasteners used for side-mounting fascia flanges where shown or specified may be exposed in the Work. Provide internal threaded aluminum rivets, stainless steel through-bolts with lock nuts, stainless steel sheet metal screws with lock washers, and epoxy adhesive for fastening components of the Work.

J. Sockets: Removable railing. Provide six-inch deep by 2.5-inch outside diameter aluminum sockets with 3.5-inch wide socket cover on bottom of each socket and on top and bottom of removable post sockets.

2.5 FINISHES

A. General:
1. Prepare surfaces for finishing in accordance with recommendation of aluminum producer and the finisher or processor.
2. Adjust and control direction of mechanical finishes specified to achieve best overall visual effect in the Work.
3. Color and Texture Tolerance: Provide uniform color and continuous mechanical texture for aluminum components. ENGINEER reserves the right to reject aluminum materials because of color or texture variations that are visually objectionable, but only where variation exceed range of variations established by manufacturer prior to fabrication, by means of range of Samples approved by ENGINEER.
4. Anodize aluminum components.

B. Mechanically finish aluminum by wheel or belt polishing with aluminum oxide grit of 180 to 220 size, using peripheral wheel speed of 6,000 feet per minute; AA Designation - M32 Medium Satin Directional Texture.
1. Hand Rubbed Finish: Where required to complete the Work and provide uniform, continuous texture, provide hand-rubbed finish to match medium satin

directional texture specified to even out and blend satin finishes produced by other means.

C. Provide non-etching chemical cleaning by immersing aluminum in inhibited chemical solution, as recommended by coating applicator, to remove lard oil, fats, mineral grease, and other contamination detrimental to providing specified finishes.
   1. Clean and rinse with water between steps as recommended by aluminum manufacturer.

D. Exposed Aluminum Anodic Coating: Provide anodic coatings as specified that do not depend on dyes, organic or inorganic pigments, or impregnation processes to obtain color. Apply coatings using only the alloy, temperature, current density, and acid electrolytes to obtain specified colors in compliance with designation system and requirements of NAAMM/AMP Pipe Railing Manual and NAAMM/AMP AMP 501. Comply with the following:
   1. Provide Architectural Class I high density anodic treatment by immersing the components in tank containing solution of 15 percent sulfuric acid at 70 degrees F with 12 amperes per square foot of direct current for minimum of sixty minutes; AA Designation A41 Clear.
   2. Physical Properties:
      a. Anodic Coating Thickness, ASTM B244: Minimum of 0.7-mils thick.
      b. Anodic Coating Weight, ASTM B137: Minimum of 32 mg/sq. in.
      c. Resistance to Staining, ASTM B136: No stain after five minutes dye solution exposure.
      d. Salt Spray, ASTM B117: 30,000 hours exposure with no corrosion or shade change.
   3. Seal finished anodized coatings using deionized boiling water to seal pores and prevent further absorption.
   4. Products and Manufacturers: Provide one of the following:
      a. Alumilite 215 Clear by Aluminum Company of America, Inc.
      b. Or equal.

2.6 SOURCE QUALITY CONTROL

A. Allowable Tolerances:
   1. Limit variation of cast-in-place inserts, sleeves and field-drilled anchor and fastener holes to the following:
      a. Spacing: Plus-or-minus 3/8-inch.
      b. Alignment: Plus-or-minus 1/4-inch.
      c. Plumbness: Plus-or-minus 1/8-inch.
   2. Minimum Handrails and Railings Systems Plumb Criteria:
      a. Limit variation of completed handrail and railing system alignment to 1/4-inch in 12.0 feet with posts set plumb to within 1/16-inch in 3.0 feet.
      b. Align rails so variations from level for horizontal members and from parallel with rake of stairs and ramps for sloping members do not exceed 1/4-inch in 12.0 feet.

3. Provide “pencil-line” thin butt joints.

B. Factory Testing:
1. Perform load test on completed handrail and railing systems. Extent of handrail and railing systems to be factory-tested shall be as shown and specified.
2. Load test completed handrail and railing systems in accordance with requirements of ASTM E935. Provide written report to ENGINEER identifying and documenting testing methods used, magnitude and location of loads superimposed, and results of such tests on actual completed handrail and railing systems, including all anchors and fasteners to be used in the Work. Testing setup shall simulate actual conditions of installation to be used in the Work.
3. Do not ship products from factory until ENGINEER accepts load testing report.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine conditions under which Work is to be performed and notify ENGINEER, in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with installation until unsatisfactory conditions are corrected.

B. Verify to ENGINEER gauge of aluminum pipe railing posts and rails brought to the Site by actual measurement of on-Site material in presence of ENGINEER.

3.2 INSTALLATION

A. General:
1. Do not erect components that have become scarred, dented, chipped, discolored, otherwise damaged or defaced. Remove from Site railing and handrail system components that have holes, cuts, gouges, deep scratches, or dents of any kind. Repairs to correct such Work will not be accepted. Remove and replace with new material.
2. Comply with installation and anchorage recommendations of NAAMM/AMP Pipe Railing Manual and NAAMM/AMP AMP 501 in addition to requirements specified and approved or accepted (as applicable) submittals.

B. Fastening to In-Place Construction:
1. Remove protective plastic immediately before installing.
2. Adjust handrails and railings prior to securing in place, to ensure proper matching at butting joints and correct alignment throughout their length. Plumb posts in each direction. Secure posts and rail ends to building or structure as follows:

a. Provide heavy-duty floor flange and anchorage devices and fasteners where necessary for securing railing systems components to in-place construction; including stainless steel threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts and other connectors as required. Refer to Section 05 05 33, Anchor Systems.
b. Anchor posts to stair stringers with stringer or support flanges, angle type or floor type as required by conditions, shop-connected to posts and bolted to steel supporting members. Flanges shall be as recommended by manufacturer. Verify that reinforcing bars have been inserted into posts before installation. Do not install posts without reinforcing bar.
c. Side-mount posts by fastening them securely in brackets attached to steel or concrete fascia as shown and in accordance with approved or accepted (as applicable) submittals.
d. Provide removable railing sections where shown. Removable railing system posts shall be provided with friction fitted reinforcing bar in each post. Provide sockets with socket covers stored in extruded toeboard. Provide aluminum pipe collars for all removable posts. Accurately locate sleeves to match post spacing.
e. Posts set in concrete shall be provided with an aluminum floor cover flange.

3. Use devices and fasteners recommended by handrail and railing systems manufacturer and as shown on approved or accepted (as applicable) submittals.

C. Cutting, Fitting and Placement:
1. Perform cutting, drilling and fitting required for installation. Set the Work accurately in location, alignment, and elevation, plumb, level, true, and free of rack, measured from established lines and levels.
2. Fit exposed connections accurately together to form tight hairline joints. Do not cut or abrade surfaces of units that have been finished after fabrication, and are intended for field connections.
3. Make permanent field splice connections using manufacturer's recommended epoxy adhesive and 5.0-inch minimum length connector sleeves. Tight press-fit field splice connectors and install in accordance with manufacturer's written instructions. Follow epoxy manufacturer's recommendations for requirements of installation and conditions of use.
4. Make splices as near as possible to posts, but not exceeding 12.0 inches from nearest post.
5. Field welding is not allowed. Make splices using pipe splice lock employing a single allen screw to lock joint.
6. Provide hinged gates as shown.
7. Provide chain sections as shown. Provide one chain length with fastening accessories for top and each intermediate rail.
8. Secure handrails to walls with wall brackets and end fittings as shown. Drill wall plate portion of the bracket to receive one bolt, unless otherwise shown for concealed anchorage. Locate brackets as shown or, if not shown, at no more than 5.0 feet on centers. Provide flush type wall return fittings with same

projection shown for wall brackets. Secure wall brackets and wall return fittings to building or structure. Refer to Section 05 05 33, Anchor Systems.

9. Securely fasten toeboards in place with not more than 1/4-inch clearance above floor level.
10. Drill one 15/64-inch diameter weep hole not more than 1/4-inch above top of location of solid reinforcing bar or tube in each post.

D. Fastening to Existing Construction:
1. Provide heavy-duty floor flange and anchorage devices and fasteners where necessary for securing handrail and railing systems components to existing construction; including stainless steel threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts and other connectors as required. Refer to Section 05 05 33, Anchor Systems
2. Use devices and fasteners recommended by handrail and railing systems manufacturer and as shown on approved or accepted (as applicable) submittals.

E. Expansion Joints:
1. Provide slip joint with internal sleeve extending 2.0-inch minimum, beyond joint on each side.
2. Construct expansion joints as for field splices, except fasten internal sleeve securely to one side of rail only.
3. Locate joints within six inches of posts.

F. Seismic Joints:
1. Discontinue handrails and railings on each side of seismic joints where handrails and railings cross over seismic joints in structure.
2. Comply with details shown.

G. Protection from Dissimilar Materials:
1. Coat aluminum surfaces in contact with dissimilar materials such as concrete, masonry, and steel, in accordance with manufacturer's recommendations and the contract documents.
2. Do not extend coating beyond contact surfaces. Remove coating where exposed-to-view in the finished Work.

3.3 CLEANING AND REPAIRING

A. Cleaning: Installer shall clean exposed surfaces of handrail and railing systems after completing installation. Comply with recommendations of both handrail and railing system manufacturer and finish manufacturer. Do not use abrasives or unacceptable solvent cleaners. Test cleaning techniques on an unused section of railing before employing cleaning technique.
1. Remove stains, dirt, grease, and other substances by washing handrails and railings systems thoroughly using clean water and soap; rinse with clean water.
2. Do not use acid solution, steel wool, or other harsh abrasives.

3. If stain remains after washing, remove defective sections and replace with new material meeting requirements of this Section.

B. Handrails and railings shall be free from dents, burrs, scratches, holes, and other blemishes. Replace damaged or otherwise defective Work with new material that conforms with this Section at no additional cost to DEPARTMENT.

C. At Substantial Completion, replace adjacent work marred by the Work of this Section.

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SECTION 05 54 63

FLOOR ACCESS HATCH COVERS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install floor access hatch covers.
   2. The Work also includes:
      a. Providing openings in and attachments to floor access hatch covers to accommodate the Work under this and other Sections, and providing for floor access hatch covers items such as anchorage devices, and all items required for which provision is not specifically included under other Sections.
      b. Providing openings in and attachments to floor access hatch covers to accommodate the work under other contracts, and assisting other contractors in building on or attaching to floor access hatch covers items such as anchorage devices, and all items required for which provision is not specifically included under other contracts.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items to be installed with or before floor access hatch covers Work.
   2. Notify other contractors in advance of installing floor access hatch covers to provide other contractors with sufficient time for installing items included in their contracts to be installed with or before floor access hatch cover Work.

C. Related Sections:
   1. Section 09 91 00, Painting.

1.2 REFERENCES

A. Standards referenced in this Section:
   1. AASHTO Standard Specifications for Highway Bridges.
   2. MIL-P-21035B, Military Specification, Paint, High Zinc Dust Content Galvanizing Repair.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer:
      a. Manufacturer shall have not less than five years experience producing products substantially similar to those specified and, upon ENGINEER's request, shall submit documentation of not less than five satisfactory installations in place for not less than five years each.

B. Component Supply and Compatibility:
   1. Obtain all products included in this Section regardless of the component manufacturer from a single floor access hatch covers manufacturer. Furnishing covers from more than one manufacturer is unacceptable.
   2. Floor access hatch covers manufacturer shall prepare, or shall review and approve, all Shop Drawings and other submittals for all components furnished under this Section.
   3. Components shall be suitable for specified service conditions and shall be integrated into the overall assembly by the floor access hatch covers manufacturer.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Detailed plans and other drawings showing location of products and direction of door swing; floor access hatch cover schedules indicating cover location, material, type, loading capacity, and other information; and fabrication details for the access hatch covers Work, including materials, thickness of metals, finishes, latching or locking provisions, type of anchorages, and accessory items.
   2. Product Data:
      a. Copies of manufacturer's literature and specifications for each type of floor access hatch incorporated in the Work.

B. Informational Submittals: Submit the following:
   1. Supplier Instructions:
      a. Installation data, including setting drawings and templates.
   2. Qualifications Statements:
      a. Manufacturer, when requested by ENGINEER.

1.4 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping:
   1. Protect mill finish and other finish during shipping and installation by an attached, adhesive-backed vinyl material that is removable during and after installation of the access hatch cover.

B. Storage and Protection:
   1. Protect steel members and packaged materials from corrosion and deterioration.

1.5 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive DEPARTMENT or CITY of other rights or remedies DEPARTMENT or CITY may otherwise have under the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by CONTRACTOR under the Contract Documents. The obligations of CONTRACTOR under the Contract Documents shall not be limited in any way by the provisions of the specified special warranty.

B. Special Warranty:
   1. Provide manufacturer's written warranty, running to the benefit of DEPARTMENT and CITY, agreeing to correct, or at option of DEPARTMENT or CITY, remove or replace structural components of the products specified in this Section found to have defect in material and workmanship during a period of five years after the date of Substantial Completion.

PART 2 – PRODUCTS

2.1 GENERAL

A. General:
   1. Provide manufacturer's standard fabricated access hatch cover units, modified when necessary to comply with the Contract Documents. Where standard units are not available for the sizes and types required, provide custom-fabricated units of the same quality as manufacturer's similar standard-sized units.
   2. Fabricate each access hatch cover unit in the shop, complete with anchors, gaskets, hardware, and accessory items, as required.

B. Provide floor access hatch covers in accordance with Table 05 54 63-A, Floor Access Hatch Covers Schedule:

TABLE 05 54 63-A, FLOOR ACCESS HATCH COVERS SCHEDULE

Hatch No.	Size		Material	Leaf Type	Frame Type	Remarks
	Width (inches)	Length[1] (inches)				
Backwash Tank	48	48	Aluminum	Dual	Channel	300 psf
Witness Tank	48	48	Aluminum	Dual	Channel	H20
Stormwater Tank	48	48	Aluminum	Dual	Channel	H20
Stormwater Tank	36	36	Aluminum	Dual	Channel	H20
Stormwater Tank	36	36	Aluminum	Dual	Channel	H20
Stormwater Tank	36	36	Aluminum	Dual	Channel	H20
Backwash Feed Vault	36	36	Aluminum	Single	Channel	300 psf
Low Service Meter Vault	36	48	Aluminum	Dual	Channel	300 psf
Treated Water Meter Vault	36	36	Aluminum	Single	Channel	300 psf

Notes:
1. On single-leaf floor access hatches, length includes the hinge side.

2.2 CHANNEL-FRAME TYPE ACCESS HATCH COVERS

A. Aluminum Floor Access Hatch Covers – Channel Frame Type:
   1. Design Live Load: 300 pounds per square foot.
   2. Products and Manufacturers: Provide one of the following:
      a. Single-Leaf Door Aluminum Access Hatch Cover:
         1) Model TPS, by U.S.F Fabrication, Inc.
         2) Type J-AL, by The Bilco Company.
         3) Or equal.
   3. Cover: Not less than 1/4-inch thick, aluminum diamond-pattern plate cover. Provide flush drop-handle for lifting the cover.
   4. Frame: Extruded aluminum channel frame with manufacturer's standard anchor tabs or continuous anchor flange around perimeter for anchorage to concrete.
   5. Drain Coupling: 1.5-inch diameter NPT threaded drain coupling welded under the channel frame for connection of a drain pipe.
   6. Gasket: EPDM gasket mechanically attached to the channel frame.
   7. Hinges: Type 316 stainless steel, heavy-duty butt hinges with Type 316 stainless steel pin fastened to door with Type 316 stainless steel tamper-resistant bolts.
   8. Latch: Type 316 stainless steel, watertight, slam-type latch with inside lever handle and outside removable exterior turn/lift handle fastened to leaf (door) with tamper-resistant Type 316 stainless steel bolts. Latch release shall be protected by a flush, gasketed, removable screw plug.
   9. Lift Assistance: Open-style stainless steel compression springs with Type 316 stainless steel guide tubes. Automatic Type 316 stainless steel hold-open arm with grip handle release.
   10. Fall-Through Prevention System: Provide access hatch cover manufacturer's standard safety grating of FRP or aluminum, constructed for live load capacity of not less than 300 psf. Provide hinges and lift-assist to

allow grating sections to automatically lock in place in full-open 90-degree position. Provide hold-open arm and release assembly of aluminum or Type 316 stainless steel. Grating shall be colored OSHA "Safety Yellow" or "Safety Orange".

11. Finish: Mill finish.

B. Aluminum Floor Access Hatch Covers (H-20 Loading) – Channel Frame Type:
   1. Design Live Load: H-20 truck loading in accordance with AASHTO Standard Specifications for Highway Bridges, intended for use in off-street locations that may occasionally be subject to H-20 wheel loads.
   2. Products and Manufacturers: Provide one of the following:
      a. Single-Leaf Door Aluminum Access Hatch Cover:
         1) Model THS, by U.S.F Fabrication.
         2) Type J-AL H-20, by The Bilco Company.
         3) Or equal.
   3. Cover: Not less than 1/4-inch thick, aluminum diamond-pattern plate cover with stiffener plates, as required. Provide flush drop-handle for lifting the cover.
   4. Frame: Extruded aluminum channel frame with manufacturer's standard anchor tabs or continuous anchor flange around the perimeter for anchorage to concrete.
   5. Drain Coupling: 1.5-inch diameter NPT threaded drain coupling welded under the channel frame for connection of a drain pipe.
   6. Gasket: EPDM gasket mechanically attached to the channel frame.
   7. Hinges: Type 316 stainless steel, heavy-duty butt hinges with Type 316 stainless steel pin fastened to door with Type 316 stainless steel tamper resistant bolts.
   8. Latch: Type 316 stainless steel, watertight, slam-type latch with inside lever handle and outside removable exterior turn/lift handle fastened to leaf (door) with tamper-resistant Type 316 stainless steel bolts. Latch release shall be protected by a flush, gasketed, removable screw plug.
   9. Lift Assistance: Open-style stainless steel compression springs with Type 316 stainless steel guide tubes. Automatic Type 316 stainless steel hold-open arm with grip handle release.
   10. Fall-Through Prevention System: Provide access hatch cover manufacturer's standard safety grating of FRP or aluminum, constructed for live load capacity of not less than 300 psf. Provide hinges and lift-assist to allow grating sections to automatically lock in place in full-open 90-degree position. Provide hold-open arm and release assembly of aluminum or Type 316 stainless steel. Grating shall be colored OSHA "Safety Yellow" or "Safety Orange".
   11. Finish: Mill finish.

C. Provide Schedule 40 PVC drain piping from the floor access hatch cover channel frame routed as indicated in the Contract Documents.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine areas and conditions under which floor access hatch cover Work will be performed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install floor access hatch covers in accordance with approved Shop Drawings and other approved submittals, the Contract Documents, and manufacturer's instructions.

B. Set floor access hatch covers level and true to line or grade, without warp or rack.

C. Drain Piping for Channel Frames:
   1. Provide drain piping from the floor access match cover channel frame routed as shown or indicated on the Drawings.
   2. Provide drain piping from the floor access hatch cover channel frame and route to the nearest floor drain or sump pit in a manner that does not obstruct access for facility operations and maintenance.
   3. After installation, fill drain piping with water. Drain piping shall be free of visible leaks.

D. Protection of Aluminum from Dissimilar Materials: Coat surfaces of aluminum in contact with dissimilar materials such as concrete, masonry, steel, and other metals in accordance with Section 09 91 00, Painting.

3.3 ADJUSTING AND CLEANING

A. Adjust leafs of floor access hatch covers as necessary to provide proper operations.

B. Remove stains, concrete splatter, oils, grease, and other foreign materials necessary and provide clean, finished surfaces.

+ + END OF SECTION + +

SECTION 05 56 00

METAL CASTINGS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install metal castings.
   2. Castings include metal items that are not part of miscellaneous metal fabrications or metal systems in other Specifications Sections.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before metal castings Work.
   2. Notify other contractors in advance of installing castings to provide other contractors with sufficient time for installing items included in their contracts to be installed with or before metal castings Work.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ANSI A14.3, Safety Requirements for Fixed Ladders.
   2. ASTM A48/A48M, Specification for Gray Iron Castings.
   3. ASTM A126, Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
   4. ASTM C478, Specification for Precast Reinforced Concrete Manhole Sections.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: Shall have at least five years experience manufacturing products substantially similar to those required and shall be able to submit documentation of at least five installations in satisfactory operation for at least five years each.

B. Component Supply and Compatibility:
   1. Obtain all frame, lid or cover, grate, and manhole step products included in this Section regardless of component manufacturer, from a single castings manufacturer.
   2. Obtain all hydrostatic pressure relief valve products included in this Section regardless of component manufacturer, from a single castings manufacturer.

3. Castings manufacturer shall review and approve or prepare all Shop Drawings and other submittals for all components furnished under this Section.
4. Components shall be constructed for specified service conditions and shall be integrated into overall assembly by castings manufacturer.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Fabrication and installation of all casting assemblies. Include plans, elevations, and details of sections and connections. Show anchorage and accessory items. Include setting drawings for location and installation of castings and anchorage devices.
   2. Product Data:
      a. Copies of manufacturer's catalog information for the products proposed for use, specifications, load tables, dimension diagrams, anchor details, and installation instructions.

B. Informational Submittals: Submit the following:
   1. Certificates:
      a. Furnish certification, signed by authorized officer of CONTRACTOR and notarized, stating that all components are furnished by the same manufacturer.
      b. Manufacturer's certification that the casting or lot of castings was made, sampled, tested and inspected in accordance with ASTM A48.
   2. Qualifications Statements: Submit qualifications for the following:
      a. Manufacturer, when required by ENGINEER.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling, and Unloading:
   1. Deliver products to the Site to ensure uninterrupted progress of the Work. Deliver anchorage materials to be embedded in concrete in ample time to prevent delaying the Work.
   2. Comply with Section 01 65 00, Product Delivery Requirements.

B. Storage and Protection:
   1. Protect materials from corrosion and deterioration.
   2. Comply with Section 01 66 00, Product Storage and Handling Requirements.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Round Manhole Frame with Solid Lid:
   1. Material: ASTM A48/A48M, Class 35 B.
   2. Products and Manufacturers: Provide one of the following:
      a. R-1530, manufactured by Neenah Foundry Company.
      b. E-1920, manufactured by East Jordan Iron Works, Inc.
      c. Or equal.

B. Round Manhole Frame with Open Grate:
   1. Material: ASTM A48/A48M, Class 35 B.
   2. Products and Manufacturers: Provide one of the following:
      a. R-1792-GG, manufactured by Neenah Foundry Company.
      b. V-3610-3, manufactured by East Jordan Iron Works, Inc.
      c. Or equal.

C. Catch Basin Frame with Grate:
   1. Material: ASTM A48/A48M, Class 35 B.
   2. Products and Manufacturers: Provide one of the following:
      a. R-2501, manufactured by Neenah Foundry Company.
      b. E-1045 M2, manufactured by East Jordan Iron Works, Inc.
      c. Or equal.

D. Valve Box Frame and Lid:
   1. Material: ASTM A48/A48M, Class 35 B.
   2. Products and Manufacturers: Provide one of the following:
      a. R-7506-F, manufactured by Neenah Foundry Company.
      b. 3671, manufactured by East Jordan Iron Works, Inc
      c. Or equal.

2.2 FABRICATION

A. Fabrication, General:
   1. Castings shall be of uniform quality, free of sand holes, gas holes, shrinkage cracks, and other surface defects.
   2. Castings shall be ground smooth and well-cleaned by shot blasting in the shop.
   3. Design and fabricate round frames and covers to prevent rocking and rattling under traffic loads that will be imposed in actual use.
   4. Fabricate castings true to pattern so that component parts fit together.
   5. Each casting shall be identifiable and, depending on its size, shall indicate the following: name of producing foundry, ASTM material designation, individual part number, and cast or heat date. Castings shall include all lettering shown or indicated on the Drawings.

2.3 FINISH

A. Cast Iron: Coat with casting manufacturer's standard asphaltic paint.

PART 3 – EXECUTION

3.1 INSPECCTION

A. Examine conditions under which Work is to be performed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Comply with casting manufacturer's printed instructions and the Contract Documents. Where castings are installed on precast concrete, fabricated fiberglass, or other fabricated products, install casting in accordance with requirements of manufacturer of product on which casting will be installed.

B. Set castings accurately to required location, alignment, and elevation, plumb, level, true and free of rack, measured from established lines and levels. Where applicable, brace temporarily or anchor temporarily in formwork.

+ + END OF SECTION + +

SECTION 06 10 53

MISCELLANEOUS ROUGH CARPENTRY

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, material, tools, equipment, and incidentals as shown, specified, and required to furnish and install all miscellaneous rough carpentry Work.
   2. The Work also includes:
      a. Providing openings in miscellaneous rough carpentry to accommodate the Work under this and other Sections and building into miscellaneous rough carpentry items such as sleeves, anchorages, inserts and other items to be embedded in or penetrating miscellaneous rough carpentry for which placement is not specifically provided under other Sections.
      b. Providing openings in miscellaneous rough carpentry to accommodate the Work under other contracts and assisting other contractors in building into miscellaneous rough carpentry items such as, sleeves, anchorages, inserts, and items required for which provision is not specifically included under other contracts.
   3. Extent of miscellaneous rough carpentry is shown or indicated on the drawings.
   4. Types of materials required include:
      a. Miscellaneous blocking, furring strips, and other miscellaneous wood framing.
      b. Lumber for temporary protection.
      c. Lumber for temporary support.
      d. Pressure treatment of lumber specified in this Section.
      e. Miscellaneous accessories.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before miscellaneous rough carpentry Work.
   2. Notify other contractors in advance of installing miscellaneous rough carpentry to provide other contractors with sufficient time for installing items included in their contracts to be installed with or before miscellaneous rough carpentry Work.

C. Related Sections:
   1. Section 05 05 33, Anchor Systems.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ALSC PS 20, American Softwood Lumber Standard.
   2. ASME B18.2.1 Square and Hex Bolts and Screws, Inch Series.
   3. ASME B18.6.1 Wood Screws, Inch Series.
   4. ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   5. ASTM D2898, Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing.
   6. ASTM D5516, Test Method for Evaluating the Flexural Properties of Fire-Retardant Treated Softwood Plywood Exposed to Elevated Temperatures.
   7. ASTM D5664, Test Method for Evaluating the Effects of Fire-Retardant Treatments and Elevated Temperatures on Strength Properties of Fire-Retardant Treated Lumber.
   8. ASTM D6305, Practice for Calculating Bending Strength Design Adjustment Factors for Fire-Retardant-Treated Plywood Roof Sheathing.
   9. ASTM D6841, Practice for Calculating Design Value Treatment Adjustment Factors for Fire-Retardant-Treated Lumber.
   10. ASTM F1667, Specification for Driven Fasteners: Nails, Spikes, and Staples.
   11. AWPA M4, Standard for the Care of Preservative Treated Wood Products.
   12. AWPA P5, Standard for Waterborne Preservatives.
   13. AWPA P17, Fire Retardant Formulations.
   14. AWPA T1, Use Category System: Processing and Treatment Standard.
   15. AWPA U1, Use Category System: User Specification for Treated Wood.
   16. APA E445S, Performance Standards and Policies for Structural-Use Panels (APA PRP-108).
   17. NIST PS-1, Construction and Industrial Plywood.
   18. National Lumber Grade Authority (NLGA), Standard Grading Rules for Canadian Lumber.
   19. Northeastern Lumber Manufacturers Association (NELMA), Standard Grading Rules for Northeastern Lumber.
   20. Southern Pine Inspection Bureau (SPIB), Standard Grading Rules for Southern Pine Lumber.
   21. West Coast Lumber Inspection Bureau (WCLIB), Standard Grading Rules.
   22. Western Wood Products Association (WWPA), Western Lumber Grading Rules.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with requirements of authorities having jurisdiction and the building code referred to in Section 01 42 00, References for size, spacing and attachment of wood members, unless more stringent requirements are shown on the drawings or specified in the Contract Documents.

B. Certifications:

1. Pressure Treatment: For each type of pressure treatment specified, submit certification by wood treating plant stating chemicals and process used, and certifying conformance with applicable standards referenced in the Contract Documents.
    a. For water borne preservatives, include statement that moisture content of treated materials was reduced to maximum of 19 percent prior to shipment to the Site.
2. Certificates of Grade: Where appearance of wood is important and grade marks will deface the Work, in lieu of grade markings on wood, submit certificates attesting that materials comply with grade requirements specified.

1.4 SUBMITTALS

A. Action Submittals; Submit the following:
    1. Shop Drawings:
        a. List of species and grade of lumber proposed for each use.
        b. Fastener schedule with location, size, material and type of each fastener to be used in the Work.

B. Informational Submittals: Submit the following:
    1. Certificates:
        a. Lumber treater's certification of compliance, in accordance with Paragraph 1.3.B.1. of this Section.
        b. Certificates of grade in accordance with Paragraph 1.3.B.2. of this Section.
    2. Manufacturer's Instructions:
        a. Chemical treatment manufacturer's instructions for proper use of each type of treated material.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling, and Unloading:
    1. Deliver products to Site to ensure uninterrupted progress of the Work. Deliver anchorage products that are to be embedded in concrete or masonry in ample time to prevent delaying the Work.
    2. Handle treated materials in accordance with AWPA M4.
    3. Comply with Section 01 65 00, Product Delivery Requirements.

B. Storage and Protection:
    1. Keep materials dry during delivery and storage.
    2. Keep materials off ground using pallets, platforms, or other appropriate supports. Protect materials from corrosion and deterioration. Stack lumber, and provide air circulation within stacks.
    3. Comply with Section 01 66 00, Product Storage and Handling Requirements.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Lumber, General:
   1. Factory-mark each piece of lumber with type, grade, mill and grading agency. Surfaces that will be exposed to view shall not have grade marks or other types of identifying marks.
   2. Nominal sizes are shown on the drawings or indicated, unless otherwise shown or indicated in the Contract Documents. Provide actual sizes as required by ALSC PS 20 for moisture content specified for each use.
      a. Provide dressed lumber, surfaced four sides (S4S), unless otherwise shown on the drawings or specified.
      b. Provide seasoned lumber with 19 percent maximum moisture content at time of dressing.
   3. Provide the following grade and species:
      a. Construction Grade, for material up to and including four-inch wide.
      b. No. 2 or better for material greater than four-inch wide up to and including 12-inch wide.
      c. Spruce-Pine-Fir, NLGA.
   4. Lumber for Protection and Temporary Support: Size and grades to conform to Laws and Regulations, including OSHA.

B. Plywood for Diaphragms: Provide the following:
   1. NIST PS-1 rated sheathing, exterior exposure, Grade C-C, with minimum thickness shown on the Drawings, and span rating not less than 24/0.
      a. Mark each sheet to identify plywood by species group or span rating, exposure durability classification, grade, and compliance with NIST PS-1. Surfaces that will be exposed to view shall not bear grade marks or other identifying marks.

C. Fasteners and Anchorages:
   1. Fasteners exposed to the weather as well as fasteners embedded in, or in contact with, preservative treated wood shall be hot-dip galvanized.
   2. Common wire nails shall conform to ASTM F1667.
   3. Wood screws shall conform to ASME B18.6.1.
   4. Lag screws and lag bolts shall conform to ASME B18.2.1.
   5. Anchorage devices shall conform to Section 05 05 33, Anchor Systems.
   6. Use joist hangers, framing anchors and clips where shown or specified.
      a. Joist hangers shall be steel, zinc coated, sized to fit the supporting member, of sufficient strength to develop full strength of the supported member in accordance with applicable building code, and furnished complete with special nails required by joist hanger manufacturer.
      b. Framing anchors shall be hot-dip galvanized steel conforming to ASTM A653/A653M, Z275 G90. Steel shall not be lighter than 18-gauge. Use special nails furnished by manufacturer for nailing.

c. Clips shall consist of hot-dip galvanized conforming to ASTM A653/A653M, Z275 G90 steel angles, minimum 3/16-inch thick.

2.2 WOOD TREATMENT

A. Preservative Treatment: Where lumber is specified in this Section as treated, comply with AWPA P5, "Alkaline Copper Quat Mixture". Mark each treated item to comply with AWPA quality mark requirements.
   1. Pressure-treat above ground items with water-borne preservatives in accordance with AWPA U1 and AWPA T1. After treatment, kiln-dry to maximum moisture content of 19 percent. Treat materials as shown on the Drawings and the following:
      a. Wood nailers, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
      b. Wood, plates, blocking, furring, stripping, and similar concealed members and wood in contact with masonry, concrete, or steel.
      c. Soffit and rain drainage framing.
   2. Complete the fabrication of treated items prior to treatment, wherever possible. If wood is cut after treatment, coat cut surfaces with heavy brush coat of same chemical used for treatment. Inspect each piece of wood after drying and discard damaged or defective pieces.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine substrates and supporting structure and conditions under which miscellaneous rough carpentry Work will be installed and notify ENGINEER in writing of conditions detrimental to proper completion of the Work. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Coordination: Fit miscellaneous rough carpentry Work to other Work and scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow proper attachment of other construction.

B. General:
   1. Discard units of material with defects that might impair quality of the Work, and units too small to fabricate the Work with minimum joints or optimum joint arrangement.
   2. Set miscellaneous rough carpentry Work accurately to required levels and lines, with members plumb and true, accurately cut and fitted.
   3. Securely attach miscellaneous rough carpentry Work to substrates by anchoring and fastening as shown on the drawings and indicated in the Contract

Documents. Countersink nail heads on exposed miscellaneous rough carpentry Work and fill holes. Make tight connections between members.

4. Install fasteners without splitting of wood, pre-drill as required and for masonry anchors fastened to wood stud wall framing.
5. Install blocking where necessary to provide a stable and secure installation of fixtures or equipment.

C. Wood Grounds, Nailers, and Blocking:
1. Provide where shown on the drawings or indicated in the contract documents, and where required for attachment of other construction such as grab bars in restrooms, dispensers, toilet partitions, shower enclosures, lavatory countertops, drinking fountains, TV monitor in the conference/ training room and cabinets and countertops. Form to shapes as shown on the drawings, indicated or required, cut as required for true line and level of Work to be attached. Coordinate location with other work involved.
2. Attach substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise shown on the drawings or indicated in the contract documents.
3. Provide permanent grounds of dressed, preservative-treated, key-bevelled lumber not less than 1.5-inch wide and of thickness required to bring face of ground to exact thickness of finish material involved. Remove temporary grounds when no longer required.

D. Plywood, General:
1. Install in accordance with the Contract Documents and requirements of authorities having jurisdiction.
2. Allow for installed clearances between individual plywood panels as specified by plywood manufacturer. Provide 1/4-inch space at panel edge joints and 1/8-inch space at panel end joints, unless otherwise recommended by manufacturer.
3. Install plywood with long dimension across supports.

+ + END OF SECTION + +

SECTION 07 11 13

BITUMINOUS DAMPPROOFING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to furnish and install bituminous dampproofing.
   2. Extent of bituminous dampproofing:
      a. Exterior face of the concrete foundation walls from finish grade to the top of the footing and horizontally across the footing.
   3. Types of products required include the following:
      a. Cold-applied asphalt heavy fibrated, solvent-based, Asbestos-free dampproofing, for exterior structure and wall surfaces above- and below-grade.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before bituminous dampproofing Work.
   2. Notify other contractors in advance of installing bituminous dampproofing to provide other contractors with sufficient time for installing items included in their contracts to be installed with or before bituminous dampproofing Work.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ASTM D1187, Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
   2. ASTM D1227, Specification for Emulsified Asphalt Used as Protective Coating for Roofing.
   3. ASTM D4479, Specification for Asphalt Roof Coatings—Asbestos-Free.
   4. ASTM D4586, Specification for Asphalt Roof Cement, Asbestos-Free.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Installer: Engage a single installer with successful experience installing bituminous dampproofing, and that is acceptable to or licensed by manufacturer of bituminous dampproofing materials, and that employs only workers with specific skill and successful experience in the type of Work required.

B Component Supply and Compatibility:
1. Provide all bituminous dampproofing of each type required produced by one manufacturer.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
1. Shop Drawings:
a. Schedule of all Project-specific surfaces where bituminous dampproofing will be applied.
2. Product Data:
a. Manufacturer's specifications and technical data for each required dampproofing material. Indicate VOC content of materials proposed.

B. Informational Submittals: Submit the following:
1. Certificates:
a. Submit bituminous dampproofing manufacturer's certification or other data substantiating that materials proposed for use comply with the Contract Documents, and are recommended by bituminous dampproofing manufacturer for the required applications.
b. Certification indicating that bituminous dampproofing materials delivered in bulk, if any, to the Site comply with the Contract Documents. Include statistical and descriptive data for each product furnished. Submit certificate with each load before using the material in the load.
c. Certification indicating compliance with Laws and Regulations for air quality regarding maximum VOC content for bituminous dampproofing materials.
d. Certification that materials furnished is Asbestos-free as required by ASTM D4479 and ASTM D4586.
2. Supplier’s Instructions:
a. Manufacturer’s instructions for handling and storing.
b. Manufacturer's instructions for application methods and application procedures.
3. Qualifications Statements:
a. Installer: Submit copy of manufacturer’s acceptance of installer and installer’s record of experience in work similar to that required under this Section.

1.5 DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials:
1. Deliver bituminous dampproofing bulk shipments in original, unopened, undamaged containers with manufacturer’s certification indicating compliance with the Contract Documents.
2. Do not store damaged or opened containers at the Site. Remove from Site and do not offer such damaged material again.

3. Include with each bulk shipment information on the material's shelf-life, date, quantity delivered, and other information as may be required to establish acceptability of materials delivered to the Site.

B. Storage of Materials:
   1. Store emulsions at temperatures above 40 degrees F.

C. Handling of Materials:
   1. Do not use solvent-based bituminous dampproofing without adequate ventilation. Prevent build-up of explosive and hazardous fumes.

1.6 PROJECT CONDITIONS

A. Environmental Requirements:
   1. Do not install bituminous dampproofing when ambient air temperature is 40 degrees F or less.
   2. Do not apply bituminous dampproofing materials to frozen substrates or to substrate in condition not complying with bituminous dampproofing material manufacturer's recommendations.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Cold-Applied, Cut-Back Asphalt Dampproofing:
   1. Asphalt Compound: Manufacturer's standard asphalt and cut-back solvent-based compound with mineral stabilizers, recommended for below-grade exterior and for above-grade interior applications, compounded to penetrate the substrate and build to a moisture-resistant, firm, elastic coating.
   2. Heavy-Fibrated, Trowel-Applied Dampproofing Material:
      a. Provide heavy-fibrated, long fibered type, trowel-applied mastic compound, complying with ASTM D4586, Type I.
      b. Products and Manufacturers: Provide one of the following:
         1) Hydrocide Mastic, by ChemRex, Inc., Sonneborn Building Products Division.
         2) 86 AF Fibered Trowel Mastic, by Karnak Chemical Corporation.
         3) Or equal.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine the substrates and conditions under which bituminous dampproofing Work will be applied, and advise ENGINEER in writing of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. General:
   1. Do not proceed with bituminous dampproofing Work until blocking, nailers, piping, conduits, and other projections through the substrate are installed, with substrate properly patched and sealed or flashed to receive the bituminous dampproofing.

B. Surface Preparation:
   1. Remove from the substrate dirt, oil, loose materials, and other substances that interfere with penetration, bond, and performance of bituminous dampproofing materials.

3.3 INSTALLATION

A. Cold-Applied, Cut-Back Bituminous Dampproofing on Exterior and Interior Surfaces:
   1. Prime the substrate when recommended by bituminous dampproofing manufacturer's instructions, using the type and quantity of primer recommended by bituminous dampproofing manufacturer.
   2. Apply coating of cold-applied, fibrated mastic bituminous dampproofing material by troweling-on to the substrate at uniform rate of one gallon per 12 square feet to provide uniform dry film thickness of not less than 1/16-inch.
   3. Cant Strips, Fillers and Extension of Coatings:
      a. On exterior surfaces, where lower edge of dampproofing terminates at a horizontal projection (including footings under walls), provide two-inch by two-inch bituminous grout cant strip.
      b. Mix sand with required bituminous material to form a plastic grout; form and compact in place. Provide bituminous grout fillers where shown and where required to close openings in the substrate.
      c. Extend coatings a distance of 12 inches onto adjoining walls, but do not extend onto surfaces to remain exposed-to-view.
   4. Fill cracks, crevices, and grooves. Coating shall be continuous and free of breaks and pinholes. Spread dampproofing around joints, grooves, and slots, and into all chases, corners, reveals, and soffits.

3.4 PROTECTION OF EXECUTED WORK

A. Protect other work from spillage of bituminous dampproofing materials, and prevent such materials from penetrating and clogging drains, conductors, and other utilities.

B. Remedy damage to other construction that is soiled or otherwise damaged during installation of bituminous dampproofing.

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SECTION 07 21 05

BUILDING INSULATION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to furnish and install building insulation.
   2. Extent of each type of building insulation is shown and indicated in the Contract Documents.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items that must be installed with or before building insulation Work.
   2. Notify other contractors in advance of the installation of building insulation to provide them with sufficient time for installing items included in their contracts that must be installed with or before building insulation Work.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ASTM C177, Test Methods for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
   2. ASTM C203, Test Method for Breaking Load and Flexural Properties of Block-Type Thermal Insulation.
   3. ASTM C236, Test Methods for Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box.
   4. ASTM C272, Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions.
   5. ASTM C303, Test Method for Dimensions and Density of Preformed Block and Board-Type Thermal Insulation.
   6. ASTM C518, Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
   7. ASTM C520, Test Methods for Density of Granular Loose Fill Insulation.
   8. ASTM C531, Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars and Monolithic Surfacings.
   9. ASTM C549, Specification for Perlite Loose Fill Insulation.
   10. ASTM C553, Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

11. ASTM C578, Specification for Rigid, Cellular Polystyrene Thermal Insulation.
12. ASTM C612, Specification for Mineral Fiber Block and Board Thermal Insulation.
13. ASTM C665, Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
14. ASTM C764, Specification for Mineral Fiber Loose-Fill Thermal Insulation.
15. ASTM D696, Test Method for Coefficient of Linear Thermal Expansion of Plastics between -30 Degrees C and 30 Degrees C with a Vitreous silica dilatometer.
16. ASTM D1621, Test Method for Compressive Properties of Rigid Cellular Plastics.
17. ASTM D2126, Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.
18. ASTM E84, Test Method for Surface Burning Characteristics of Building Materials.
19. ASTM E96, Test Methods for Water Vapor Transmission of Materials.
20. ASTM E119, Test Methods for Fire Tests of Building Construction and Materials.
21. UL 1479, Fire Tests of Through-Penetration Firestops.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturers:
      a. Obtain building insulations, requiring hydrochlorofluorocarbon blowing agent from manufacturer(s) that manufacture product required using blowing agent acceptable for use until the year 2020 and complying in all respects with Copenhagen Amendments to the Montreal Protocol.
      b. Manufacturer shall provide complete technical services including preparation and review of Shop Drawings and submittals, installation methods, and proposed detailing for the Work.
   2. Installer: Engage single installer for each type of building insulation. Each installer shall be skilled, trained, and have record of successful experience in applying and installing each product, and possess successful record of performing work in accordance with recommendations and requirements of manufacturer or that can submit written evidence of being acceptable to manufacturer for providing the required Work. Installers shall employ only tradesmen with specific skill and successful experience in each type of Work required. Submit to ENGINEER name and qualifications of each installer with the following information for at least three successful, completed projects per installer:
      a. Names and telephone numbers of owner and architect or ENGINEER responsible for each project.
      b. Approximate contract cost of the building insulation system installed.
      c. Quantity (area) of building insulation installed.

B. Regulatory Requirements: Comply with code interpretations by authorities having jurisdiction at the Site.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Drawings showing extent of the building insulation Work and all details required for the Work, referencing system components provided as Samples.
      b. Complete selection of fire stop manufacturer's recommended systems for each condition and kind of penetration encountered in the Work. Coordinate with equipment manufacturers for required number and kind of penetrations through fire-rated construction. Provide schedule of penetrations and fire stop system to be included for each condition and kind of penetration encountered.
   2. Product Data:
      a. Material specifications and general recommendations from building insulation manufacturer for each type of building insulation product. Include manufacturer's data substantiating that materials comply with Contract Documents.
      b. Test Reports: Copies of reports of tests on materials being furnished or previously-manufactured, identical materials verifying compliance with physical properties and environmental features specified in the Contract Documents
   3. Samples:
      a. Twelve-inch by twelve-inch Samples of each required type of building insulation.

B. Informational Submittals: Submit the following:
   1. Manufacturer's Instructions: Manufacturer's installation instructions. Indicate by copy of transmittal form that installer has received copy of manufacturer's installation instructions.

1.5 DELIVERY, STORAGE AND HANDLING

A. Delivery and Handling of Materials:
   1. Do not deliver insulation materials to the Site before the time of installation.
   2. Deliver materials in sufficient quantities to allow uninterrupted continuity of the Work.
   3. Handle materials carefully to avoid damage and breakage or compressing of boards to less than their specified thickness, or other damage.
   4. Handle materials in manner that prevents inclusion of foreign materials.
   5. Conform to Section 01 65 00, Product Delivery Requirements.

B. Storage of Materials:

1. Store materials in dry, enclosed area, off ground and away form possible contact with water, ice, and snow.
2. Prevent damage to materials during storage, including minimizing the time materials are stored at the Site before being incorporated into the Work. Store only sufficient quantity of building insulation materials at the Site required for continuous advancement of the Work without causing delay.
3. Conform to Section 01 66 00, Product Storage and Handling Requirements.

1.6 SITE CONDITIONS

A. Environmental Conditions:
   1. Complete the installation and concealment of building insulation materials as rapidly as possible to avoid damage from adjacent construction operations and adverse weather conditions.
   2. Install building insulations when weather and temperature conditions comply with building insulations manufacturers' written recommendations.
   3. Install building insulations when damaging environmental condition are not forecasted for the time when exposed systems materials components would be exposed to potential damage from the elements.
   4. Protect building insulation Work from precipitation, frost, and direct sunlight.
   5. Do not apply pressure-sensitive tape when temperature is below 35 degrees F or above 110 degrees F.
   6. Record decisions, conditions, and agreements to proceed with the Work when weather conditions may be unfavorable. State reasons for proceeding, along with names of persons involved, and changes or revisions (if any), if required, to allow the Work to proceed.

1.7. SCHEDULING

A. Proceed with building insulation Work when preceding Work is ready to receive the Work of this Section.

B. Proceed with building insulation and associated Work after curbs, blocking, substrate board, nailer strips, vents, drains and other projections through the substrates have been installed, and when substrate construction and framing of openings is complete.

C. Proceed with and complete the Work when materials, equipment and tradesmen required for the installation of building insulation and backfilling operations are at the Site and ready to follow with the Work in manner that does not leave the Work vulnerable to damage or deterioration.

D. Do not advance installation of building insulation beyond that necessary for proper sequencing of the Work. Do not advance the Work when there is no proper and secure protection from damaging weather and construction activities.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Performance Criteria:
   1. Thermal Conductivity: Thicknesses shown are for thermal conductivity, k-value at 75 degrees F, specified for each material.
   2. Provide adjusted thicknesses based on thicknesses shown or specified for building insulations, as required to comply with required thermal resistances for material having different thermal conductivity.

2.2 MATERIALS

A. Glass Fiber Insulations: Provide the following types:
   1. General: Provide insulations formed from glass fibers and resinous binders fabricated into flexible blankets, semi-rigid and rigid sheets complying with ASTM C665, ASTM C553, and ASTM C612.
   2. Flame-resistant Vapor Barrier Faced Batt Insulation: Provide thermal batt insulation, faced on one side with foil-reinforced-kraft laminate vapor barrier complying with ASTM C665, Type III, Class A.
      a. Physical Properties:
         1) Thermal Conductivity (k), ASTM C518: 0.33 Btu/inch/hour/square foot/degree F maximum.
         2) Density, ASTM C303: 1.5 pounds per cubic foot (pcf).
         3) Water Vapor Transmission, ASTM E96: 0.10 perm/inch.
         4) Flame Spread, ASTM E84: 25.
         5) Smoke Developed, ASTM E84: 50.
         6) Fuel Contributed, ASTM E84: 50.
      b. Thickness: 10 inches minimum.
      c. Width: Varies.
      d. Products and Manufacturers: Provide one of the following:
         1) FS-25 FRK Faced Thermal Batt Insulation by Owens-Corning Fiberglass Corporation.
         2) FSK-25 Thermal Batt Insulation by Johns Manville.
         3) Or equal.

B. Foam Plastic Insulations: Provide the following types:
   1. General: Rigid, closed-cell, thermally stabilized, extruded, hydrochlorofluro-carbon blown, foam board insulation consisting of 100 percent virgin extruded polystyrene modified resin complying with ASTM C578.
   2. Provide blowing agent with lowest available ozone depletion potential, such as HCFC-142b or better. HCFC-141b is not acceptable.
   3. Perimeter Foundation Insulations: Provide very high-load-resisting, rigid foam board insulation complying with ASTM C578, Type VI.
      a. Physical Properties: Provide the following:
         1) Thermal Conductivity (k), ASTM C177 and ASTM C518: 0.20

Btu/inch/hour/square foot/degree F.

2) Compressive Strength (psi at five percent deformation) ASTM D1621: 40 psi minimum.
3) Flexural Strength, ASTM C203: 60 psi minimum.
4) Coefficient of Thermal Expansion, ASTM D696: 3.5x10^5 inches/inch/degree F.
5) Water Absorption, ASTM C272: Less than 0.1 percent by volume maximum.
6) Water Vapor Permeance, ASTM E96: 0.3 to 0.8 perms/inch maximum.
7) Flame Spread, ASTM E84: Five.
8) Smoke Developed, ASTM E84: 165 maximum.

b. Thickness: one layer each two inches thick.
c. Width: 2.0 feet.
d. Length: 8.0 feet.
e. Products and Manufacturers: Provide one of the following:
1) STYROFOAM 40 HIGH LOAD by the Dow Chemical Company.
2) Foamular 400 by Owens-Corning Fiberglass Corporation.
3) Or equal.

C. Mineral Fiber Insulation: Provide the following types:
1. General: Provide insulations formed from inorganic mineral fiber extrusions spun at 2,500 degrees F complying with ASTM C665 and ASTM C764.
2. Loose Mineral Fiber Insulation: Provide non-asbestos rock, slag, or glass processed into fiber and formed into loose resilient wool mass or granular modules complying with ASTM C764, Type 1 (for blowing) Type 2 (for pouring).
a. Physical Properties:
1) Thermal Conductivity (k), ASTM C764: 0.46 Btu/inch/hour/square foot/degree F.
2) Ignition Loss: Less than one percent (99 percent pure mineral fiber).
3) Density, ASTM C 64: 1.5 pounds per cubic foot (pcf).
b. Products and Manufacturers: Provide one of the following:
1) Industrial Mineral Wool Fiber by Rock Wool Industries, Inc.
2) FBX Insulating Wool by Fibrex, Inc.
3) Or equal.
3. Sound Attenuation Fire Blanket Insulation: Provide insulation containing non-asbestos, non-combustible compounds of spun mineral fiber felt formed into flexible, resilient blankets complying with ASTM C665, Type I.
a. Physical Properties:
1) Thermal Conductivity (k), ASTM C518: 0.27 Btu/inch/hour/square foot/degree F.
2) Density, Manufacturer's Certified Test: 2.5 pounds per cubic foot (pcf).
b. Thicknesses: 3 1/2 inches.

c. Width: 16 inches.
d. Products and Manufacturers: Provide one of the following:
1) Thermafiber SAFB Batts by USG Interiors, Inc.
2) Sound Control Fire Blankets by Fibrex, Inc.
3) Or equal.

4. Safing Insulation: Provide unfaced semi-rigid non-asbestos, non-combustible blankets composed of compounds of spun mineral fiber felt, complying with ASTM C665, Type I.
a. Physical Properties:
1) Thermal Conductivity (k), ASTM C518: 0.25 Btu/inch/hour/square foot/degree F.
2) Density, Manufacturer's Certified Test: Four pounds per cubic foot (pcf).
3) Flame Spread, ASTM E84: 15 maximum.
4) Smoke Developed, ASTM E84: Five maximum.
5) Fire Resistance Rating, ASTM E119: Three hours.
b. Thickness: Four inches.
c. Width: 2.0 feet.
d. Products and Manufacturers: Provide one of the following:
1) Thermafiber Safing Insulation by USG Interiors, Inc.
2) FBX Safing Insulation by Fibrex, Inc.
3) Or equal.

D. Fire-Stop Sealants and Other Fire-Stop System Components: Provide the following:
1. Complete selection of fire-stop manufacturer's recommended silicone rubber fire-stop systems. Provide complete systems complying with UL 1479 with two- or three-hour fire rating. Provide equal fire protection as provided by fire-rating of construction penetrated.
2. Provide multiple component systems coordinated to meet actual conditions encountered in the Work and as recommended by fire-stop manufacturer. In addition to providing fire resistance, fire-stop systems shall also be gas and watertight.
3. Products and Manufacturers: Provide one of the following:
a. 3M Fire Stop Systems by 3M, Inc.
b. Or equal.

E. Miscellaneous Materials and Accessories: Provide the following:
1. Adhesive for Bonding Insulation: Type recommended by insulation manufacturer, and complying with fire resistance requirements.
2. Mechanical Anchors: Type and size shown or, if not shown, as recommended by insulation manufacturer for type of application shown and condition of substrate.
3. Wire Mesh Insulation Support: Two-inch by 24-gage galvanized steel wire hexagonal woven mesh.

4. Safing Impaling Clips: Provide galvanized steel impaling clips complying with requirements of code authorities having jurisdiction at the Site and as recommended by insulation manufacturer for full system responsibility.
5. Protection Board: Fiberboard sheathing or heavy duty asphaltic panels as recommended by insulation manufacturer.
6. Adhesive Tapes: Complete selection of insulation manufacturer's recommended taping materials.
7. Bitumen: Asphalt, ASTM D 449.

PART 3 – EXECUTION

3.1 INSPECTION

A. CONTRACTOR and installer shall examine substrate and conditions under which building insulation Work will be performed and notify ENGINEER in writing of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surfaces to receive building insulation shall be clean of all debris, dirt, and other contamination before installation begins.

3.3 INSTALLATION

A. General:
   1. Comply with manufacturer's instructions for particular conditions of installation in each case. If printed instructions are not available or do not apply to Site conditions, before proceeding with the Work obtain from manufacturer and submit to ENGINEER specific installation recommendations from manufacturer.
   2. Extend insulations full thickness over entire surface to be insulated. Cut and fit tightly around obstructions. Fill voids with insulation.
   3. Apply number of layers of insulation specified, each of required thickness, or required thickness to provide thermal value shown or indicated in the Contract Documents, to make up the total thickness.

B. Unit-type Building Insulation:
   1. Apply insulation units of type shown or indicated to substrate by method indicated. If not otherwise indicated and except for units resting on horizontal surfaces, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
   2. Exercise extreme care to avoid damaging and soiling of faces on insulation units that will remain exposed-to-view. Align joints accurately, with adjoining surfaces set flush.

3. Set vapor barrier faced units with vapor barrier to warm side of construction, (usually toward inside), except as otherwise shown or indicated. Do not obstruct ventilation spaces, except for fire-stopping.
4. Tape joints and ruptures in vapor barriers using adhesive tape of type recommended by insulation manufacturer, and seal each continuous area of insulation to surrounding construction so as to ensure vapor-tight installation of the units.

C. Safing Insulations and Fire-Stop Systems:
1. Install safing insulation and fire-stop systems to present continuous fire-rated fire barrier in areas shown and at perimeter of all fire-rated partitions and poke-through floor and wall penetrations, to maintain continuity of fire-rated construction whether or not shown.
2. Install fire stop sealants and other fire stop system components in thicknesses recommended by manufacturer at all locations where poke-through penetrations occur, at all locations where other penetrations such as ducts, pipe, cables, cable trays, and conduit occur and at perimeter of all fire-rated walls.
3. Include all components of manufacturer's fire/smoke-stop systems for complete system responsibility installed in accordance with manufacturer’s written recommendations and specifications.

D. Board-type Perimeter and Under-Slab Insulation:
1. Install perimeter insulation after concrete footings have been poured and before on-grade concrete slab work begins.
2. Remove projections that interfere with placing.
3. Apply single 2.0-foot-wide continuous band of insulation of required thickness and number of layers at slab-on-grade buildings whether or not shown. Stagger joints between layers of insulation and butt insulation tightly together.
4. Protect top surface of horizontal insulation from damage during concrete Work by applying protection course material recommended by insulation manufacturer.
5. On vertical surfaces, set units in adhesive applied in accordance with manufacturer’s instructions. Use type of adhesive recommended by manufacturer of board-type perimeter insulation.
6. Tape bottom edge of insulation before temporarily attaching insulation to wall with mastic.
7. Tape all joints in vertical wall insulation.
8. Protect insulation on vertical surfaces from damage during backfilling by applying protection course material recommended by insulation manufacturer. Set in adhesive in accordance with recommendations of insulation manufacturers and protection course material.

E. Batt-type Insulation:
1. Install batt insulation above ceilings and between trusses as shown. Extend insulation full width and length in areas shown.
2. Fit tightly around obstructions to form uniform, insulated barrier.

F. Correcting Defective Work:
   1. System components that are dislodged, damaged, expanded, broken, penetrated, or crushed by subsequent installation operations or damaged by detrimental weather shall be immediately replaced with undamaged material in compliance with the Contract Documents and properly protected as specified.
   2. Only original installer shall repair or replace deteriorated or defective Work.

3.4 PROTECTION

A. Protection from Elements:
   1. Protect all components of the Work from detrimental weather conditions. Do not allow building insulation materials to become wet or soiled, or covered with ice or snow. Provide continuous protection of materials against damage, wetting and moisture absorption and storing materials as specified
   2. Work that cannot, for reasons acceptable to ENGINEER, be covered with complete construction system before onset of weather detrimental to the Work, shall be completely covered and protected in manner that deflects precipitation from building insulations without damaging adjacent Work.
   3. Protect foam plastic building insulation from exposure to sunlight.

B. Protection During Construction:
   1. Protect all components of the Work from construction operations including, but not limited to, backfilling and concrete unit masonry Work, until work is completed and acceptable to ENGINEER.
   2. Protect building insulations from damage and abuse by other contractors and installers until readiness for final payment.
   3. Do not allow building insulations to come into contact with welding operations or other fire or ignition sources.
   4. Do not allow construction traffic not associated with installation of building insulation in the area of building insulation Work. Protect the area from access by other installers and contractors until the building insulation Work has been incorporated into finished construction systems.

C. Building insulation that becomes wet, damaged, or deteriorated shall be promptly removed from the Site and replaced with materials conforming to this Section.

+ + END OF SECTION + +

SECTION 07 92 00

JOINT SEALANTS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to furnish and install joint sealants.
   2. Extent of each type of calking and sealant is shown or indicated and includes the following:
      a. Interior and exterior joints in equipment and construction systems not filled by another material, and that are not required to be open for operation.
      b. Exposed-to-view joints of all fire-rated sealants.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate installation of items to be installed with or before joint sealants.
   2. Notify other contractors in advance of installation of joint sealants to provide other contractors with sufficient time for installing items included in their contracts to be installed before joint sealants.
   3. Coordinate final selection of joint sealants so that materials are compatible with all calking and sealant substrates specified.

C. Related Sections:
   1. Section 03 00 05, Concrete.
   2. Section 07 21 05, Building Insulation.
   3. Section 08 81 00, Glass Glazing.
   4. Section 13 34 19, Metal Building Systems.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ASTM C510, Test Method for Staining and Color Change of Single- or Multicomponent Joint Sealants.
   2. ASTM C661, Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer.
   3. ASTM C793, Test Method for Effects of Accelerated Weathering on Elastomeric Joint Sealants.
   4. ASTM C794, Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
   5. ASTM C920, Specification for Elastomeric Joint Sealants.

6. ASTM C1021, Practice for Laboratories Engaged in Testing Building Sealants.
7. ASTM C1087, Test method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.
8. ASTM C1193, Guide for Use of Joint Sealants.
9. ASTM C1247, Practice for Durability of Sealants Exposed to Continuous Immersion in Liquids.
10. BAAQMD Regulation 8, Rule 51.
11. 40 CFR 59, Subpart D (EPA Method 24): National Volatile Organic Compound Emission Standards for Architectural Coatings
12. FS TT-S-00227, Sealing Compound: Elastomeric Type, Multi-component (for Calking, Sealing, and Glazing in Buildings and Other Structures).
13. FS TT-S-00230 Sealing Compound: Elastomeric Type, Single Component (for Calking, Sealing, and Glazing in Buildings and Other Structures).
14. NSF/ANSI Standard 61, Drinking Water System Components - Health Effects.
15. SCAQMD Rule 1168.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Installer:
      a. Engage a single installer, approved by product manufacturer, regularly engaged in calking and sealant installation and with successful experience in applying types of products required, and who employs only tradesmen with specific skill and successful experience in the type of Work required.
   2. Testing Laboratory:
      a. Furnish services of independent testing laboratory qualified according to ASTM C1021, for conducting testing required.

B. Component Supply and Compatibility:
   1. Obtain materials only from manufacturers who will, if required:
      a. Test joint sealants for compatibility with substrates for conformance with FS-TT-S-00227, and recommend remedial procedures as required.
   2. Before purchasing each sealant, investigate its compatibility with joint surfaces, joint fillers, and other materials in joint system. Provide products that are fully compatible with actual installation condition, verified by manufacturer's published data or certification, and as shown on approved Shop Drawings and other approved submittals.

C. Product Testing: Provide test results of laboratory pre-construction compatibility and adhesion testing, as specified in Article 3.1 of this Section, by qualified testing laboratory, based on testing of current sealant formulations within a 36-month period preceding the Notice to Proceed for the Work.
   1. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C920 and, where applicable, to other standard test methods.
   2. Test other joint sealants for compliance using specified post-construction field adhesion test.

D. Mock-ups:

1. Prior to installing joint sealant Work but after ENGINEER's approval of Samples, provide Sample of each type of calking and sealant in areas selected by ENGINEER to show representative installation of calkings and sealants. Obtain ENGINEER's approval of visual qualities of mock-ups before starting calking and sealant Work. Retain and protect mock-ups during construction as a standard for judging completed calking and sealant Work. Do not alter or destroy mock-ups until so allowed by ENGINEER.
2. Perform the following testing on calking and sealant mock-up, as specified in this Section: Post-construction field adhesion testing and water leak test.
3. Work that does not comply with test requirements on Sample areas will be considered defective.

E. Pre-installation Conference:

1. Prior to installing joint sealants and associated Work, schedule and meet at the Site with calking and sealant installer, calking and sealant manufacturer's technical representative, other trades involved in coordinating with calking and sealant Work, ENGINEER, and OWNER. Record discussions of pre-installation conference and decisions, agreements, and disagreements, and furnish copy of record to each party attending conference. Review foreseeable methods and procedures related to calking and sealant Work, including reviewing:
   a. Required submittals, both completed and yet to be completed.
   b. Status of test reports.
   c. Mock-up construction results.
   d. Status of substrate and similar considerations.
   e. Each major calking and sealant application required.
   f. Availability of products, tradesmen, equipment, and facilities required for avoiding delays.
2. Reconvene conference at earliest opportunity if additional information must be developed to conclude subjects under consideration.
3. Record revisions or changes agreed upon, reasons therefore, and parties agreeing or disagreeing with them.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:

1. Shop Drawings:
   a. Schedule of joint sealants installation, indication each specific surface where calking or sealants are to be provided and the material proposed for each application.
2. Product Data:
   a. Copies of manufacturer's data sheets including color charts, specifications, recommendations, and installation instructions for each type of sealant, calking compound, and associated miscellaneous material required. Include manufacturer's published data, indicating that each

product complies with the Contract Documents and is intended for the applications shown or indicated.

b. Product test reports.

3. Samples:

a. Each type of actual cured material of each calking and sealant specified, in each of manufacturer's standard colors.

b. Samples will be reviewed by ENGINEER for color and texture only. Compliance with other requirements is responsibility of CONTRACTOR.

B. Informational Submittals: Submit the following:

1. Certificates:

a. Certify that materials are suitable for intended use and materials meet or exceed requirements of the Contract Documents.

b. Certification from manufacturer that products furnished are appropriate for surfaces and conditions to which they will be applied.

c. Certify that applicator is approved by manufacturer.

2. Field Quality Control Submittals:

a. Results of tests on job mock-ups.

b. Pre-construction and post-construction field test reports.

c. Compatibility and adhesion test reports.

d. CONTRACTOR's Field Test Report Logs:

1) Indicate time present at the Site.

2) Include observations and results of field tests, and document compliance with manufacturer's installation instructions and supplemental instructions provided to installers.

3. Pre-installation conference record.

4. Qualifications: Submit qualifications for:

a. Installer.

C. Closeout Submittals: Submit the following:

1. Operation and Maintenance Data:

a. Recommended inspection intervals.

b. Instructions for repairing and replacing failed sealant joints.

2. Warranty: Submit written warranties as specified in this Section.

1.5 DELIVERY, STORAGE AND HANDLING

A. Comply with Section 01 65 00, Product Delivery Requirements, and Section 01 66 00, Product Storage and Handling Requirements, and the following:

1. Delivery of Products:

a. Deliver products in calking and sealant manufacturer's original unopened, undamaged containers, indicating compliance with approved Shop Drawings and approved Sample color selections.

b. Include the following information on label:

1) Name of material and Supplier.

2) Formula or Specification Section number, lot number, color and date of manufacture.

3) Mixing instructions, shelf life, and curing time, when applicable.

2. Storage of Products:
   a. Do not store or expose materials to temperature above 90 degrees F or store in direct sunlight.
   b. Do not use materials that are outdated as indicated by shelf life.
   c. Store sealant tape in manner that will not deform tape.
   d. In cool or cold weather, store containers for sixteen hours before using in temperature of approximately 75 degrees F.
   e. When high temperatures prevail, store mixed sealants in a cool place.
3. Handling:
   a. Do not open containers or mix components until necessary preparatory Work and priming are complete.

1.6 JOB CONDITIONS

A. Environmental Conditions:
   1. Do not install joint sealants under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitations for installation.
   2. Proceed with the Work when forecasted weather conditions are favorable for proper cure and development of high-early bond strength.
   3. Where joint width is affected by ambient temperature variations, install elastomeric sealants when temperatures are in the lower third of manufacturer's recommended installation temperature range, so that sealant will not be subjected to excessive elongation and bond stress at subsequent low temperatures.
   4. When high temperatures prevail, avoid mixing sealants in direct sunlight.
   5. Supplemental heat sources required to maintain both ambient and surface temperatures within the range recommended by manufacturer for material applications are not available at the Site.
   6. Provide supplemental heat and energy sources, power, equipment, and operating, maintenance, and temperature monitoring personnel.
   7. Do not use heat sources that emit carbon dioxide or carbon monoxide into areas of calking, sealants, and painting Work, and areas where CITY's personnel or construction personnel may work. Properly locate and vent such heat sources to outdoors so that joint sealants and other Work are unaffected by exhaust.

1.7 WARRANTY

A. Provide written warranty, signed by manufacturer and CONTRACTOR, agreeing to repair or replace sealants that fail to perform as air-tight and watertight joints; or fail in joint adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, or general durability; or appear to

deteriorate in any other manner not clearly specified in approved Shop Drawings and other submittals, as an inherent quality of material for exposure indicated.

1. Provide manufacturer warranty for period of one year from date of Substantial Completion of joint sealants Work.
2. Provide installer warranty for period of two years from date of Substantial Completion of joint sealants Work.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Provide elastomeric joint sealants for interior and exterior joint applications that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. Provide colors selected by ENGINEER from calking and sealant manufacturer's standard and custom color charts. "Or equal" manufacturers shall provide same generic products and colors as available from manufacturers specified.

2.2 MATERIALS

A. Exterior and Interior Horizontal and Vertical Joints; Submerged and Intermittently Submerged:
   1. Two-component Polyurethane Sealant:
      a. Products and Manufacturers: Provide one of the following:
         1) Sikaflex- 2c NS by Sika Corporation.
         2) Or equal.
      b. Two-component, moisture cured, gun grade, polyurethane sealant, complying with:
         1) FS TT-S-00227E, Type II, Class A; ASTM C920, Type M, Grade NS, Class 25.
         2) Adhesion-in-Peel, FS TT-S-00227E, ASTM C794 (Minimum five pounds per linear inch with no adhesion failure): 18 pounds.
         3) Hardness (Standard Conditions), ASTM C661: 25 (Shore A).
         4) Stain and Color Change, FS TT-S-00227E and ASTM C510: No discoloration or stain.
         5) Accelerated Aging, ASTM C793: No change in sealant characteristics after 250 hours in weatherometer.
         6) Rheological Vertical Displacement at 120 degrees F, FS TT-S-00227E: No sag.
         7) VOC Content: 220 g/L, maximum.
         8) Listed in NSF/ANSI 61.

B. Exterior and Interior Vertical Joints; Non-submerged:
   1. Two-component Polyurethane Sealant:

a. Products and Manufacturers: Provide one of the following:
   1) Sikaflex- 2c NS by Sika Corporation.
   2) Dymeric 240 FC by Tremco Sealant/Waterproofing Division of RPM International, Inc.
   3) Or equal.
b. Polyurethane based, two-component elastomeric sealant complying with:
   1) FS TT-S-00227E: Type II (non-sag) Class A and ASTM C920, Type M, Grade NS, Class 25.
   2) Adhesion-in-Peel, FS TT-S-00227E and ASTM C794: (Minimum five pounds per linear inch with no adhesion failure): 10 pounds.
   3) Hardness (Standard Conditions), ASTM C661: 25 to 35 (Shore A).
   4) Stain and color change, FS TT-S-00227E and ASTM C510: No discoloration or stain.
   5) Accelerated Aging, ASTM C793: No change in sealant characteristics after 250 hours in weatherometer.
   6) Rheological Vertical Displacement at 120 degrees F, FS TT-S-00227E: No sag.
   7) VOC Content: 100 g/L, maximum.

C. Exterior and Interior Horizontal Joints; Non-submerged:
   1. Two-component Polyurethane Sealant:
      a. Products and Manufacturers: Provide one of the following:
         1) Sikaflex- 2c SL by Sika Corporation.
         2) THC/900 by Tremco Sealant/Waterproofing Division of RPM International, Inc.
         3) Or equal.
      b. Polyurethane based, two-component elastomeric, self-leveling sealant complying with the following:
         1) FS TT-S-00227E, Type I (self-leveling) Class A. and ASTM C920, Type M, Grade P, Class 25
         2) Water Immersion Bond, FS TT-S-00227E: Elongation of 50 percent with no adhesive failure.
         3) Hardness (Standard Conditions), ASTM C661: 35 to 45.
         4) Stain and Color Change, FS TT-S-00227E and ASTM C510: No discoloration or stain.
         5) Accelerated Aging, ASTM C793: No change in sealant characteristics after 250 hours in weatherometer.
         6) VOC Content: 165 g/L, maximum.

D. Miscellaneous Materials:
   1. Joint Cleaner: As recommended by calking and sealant manufacturer.
   2. Joint Primer and Sealer: As recommended for compatibility with calking and sealant by calking and sealant manufacturer.
   3. Bond Breaker Type: Polyethylene tape or other plastic tape as recommended for compatibility with calking and sealant by calking and sealant manufacturer, to be applied to sealant-contact surfaces where bond to substrate or joint filler

must be avoided for proper performance of calking and sealant. Provide self-adhesive tape where applicable.

4. Sealant Backer Rod: Compressible rod stock polyethylene foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable nonabsorptive material as recommended for compatibility with calking and sealant by calking and sealant manufacturer. Provide size and shape of rod that will control joint depth for sealant placement, break bond of sealant at bottom of joint, form optimum shape of sealant bead on back side, and provide highly-compressible backer to minimize possibility of sealant extrusion when joint is compressed.
5. Low-temperature Catalyst: As recommended by calking and sealant manufacturer.

E. Products for Other Applications:
1. Glazing Sealants: Refer to Section 08 81 00, Glass Glazing.
2. Fire-Rated Sealants: Refer to Section 07 21 05, Building Insulation.
3. Compressible Filler: Refer to Section 04 05 19, Masonry Anchorage and Reinforcing.
4. Acoustical Sealants: Refer to Section 09 51 13, Acoustical Panel Ceilings.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine joint surfaces, substrates, backing, and anchorage of units forming sealant rabbet, and conditions under which calking and sealant Work will be performed, and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work and performance of sealants. Do not proceed with calking and sealant Work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Protection: Do not allow joint sealants to overflow or spill onto adjoining surfaces, or to migrate into voids of adjoining surfaces including rough textured materials. Use masking tape or other precautionary devices to prevent staining of adjoining surfaces, by either the primer/sealer or calking and sealant materials.

B. Joint Surface Preparation:
1. Clean joint surfaces immediately before installing sealant compound. Remove dirt, weakly adhering coatings, moisture and other substances that would interfere with bonds of sealant compound as recommended in sealant manufacturer's written instructions as shown on approved Shop Drawings.
2. If necessary, clean porous materials by grinding, sandblasting, or mechanical abrading. Blow out joints with oil-free compressed air or by vacuuming joints prior to applying primer or sealant.

3. Roughen joint surfaces on vitreous coated and similar non-porous materials, when sealant manufacturer's data indicates lower bond strength than for porous surfaces. Rub with fine abrasive cloth or steel wool to produce a dull sheen.
4. Concrete Joint Preparation: Refer to Section 03 15 00, Concrete Accessories.

C. Mixing:
1. Comply with sealant manufacturer's written instructions for mixing multi-component sealants.
2. Thoroughly mix components before use.
3. Add entire contents of activator can to base container. Do not mix partial units.
4. Mix contents for minimum of five minutes or as recommended by sealant manufacturer, until color and consistency are uniform.

3.3 INSTALLATION

A. Install joint sealants after adjacent areas have been cleaned and before joint has been cleaned and primed, to ensure calking and sealant joints will not be soiled. Replace calking and sealant joints soiled after installation.

B. Comply with sealant manufacturer's written instructions except where more stringent requirements are shown or indicated in the Contract Documents, and except where manufacturer's technical representative directs otherwise, only as acceptable to ENGINEER.

C. Prime or seal joint surfaces as shown on approved Shop Drawings and approved other submittals. Do not allow primer or sealer to spill or migrate onto adjoining surfaces. Allow primer to dry prior to applying sealants.

D. Apply masking tape before installing primer, in continuous strips in alignment with joint edge to produce sharp, clean interface with adjoining materials. Remove tape immediately after joints have been sealed and tooled as directed.

E. Confirm that compressible filler is installed before installing sealants. Refer to Section 04 05 05, Unit Masonry Construction, for locations.

F. Do not install sealants without backer rods and bond breaker tape.

G. Roll back-up rod stock into joint to avoid lengthwise stretching. Do not twist, braid, puncture, or prime backer rods.

H. Employ only proven installation techniques that will ensure that sealants are deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of joint bond surfaces equally on opposite sides. Except as otherwise indicated, fill sealant rabbet to a slightly concave surface slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and a vertical surface, fill joint to form a slight cove, so that joint will not trap moisture and dirt.

I. Install sealants to depths recommended by sealant manufacturer but within the following general limitations, measured at the center (thin) section of bead.
   1. For horizontal joints in sidewalks, pavements, and similar locations sealed with elastomeric sealants and subject to traffic and other abrasion and indentation exposures, fill joints to depth equal to 75 percent of joint width, but not more than 5/8-inch deep or less than 3/8-inch deep.
   2. For vertical joints subjected to normal movement and sealed with elastomeric sealants and not subject to traffic, fill joints to a depth equal to 50 percent of joint width, but not more than 1/2-inch deep or less than 1/4-inch deep.

J. Remove excess and spillage of compounds promptly as the Work progresses.

K. Cure calking and sealant compounds in compliance with manufacturer's instructions and recommendations, to obtain high-early bond strength, internal cohesive strength, and surface durability.

3.4 FIELD QUALITY CONTROL

A. Post-construction Field Adhesion Testing: Before installing elastomeric sealants, field-test joint sealant adhesion to joint substrates as follows:
   1. Extent of Testing: Test completed elastomeric sealant joints as follows:
      a. Perform ten tests for the first 1,000 feet of joint length for each type of elastomeric sealant and joint substrate.
      b. Perform one test for each 1,000 feet of joint length thereafter, and minimum of one test per each floor per elevation.
      c. Test Method: Test joint sealants according to Method A, Field-applied Sealant Joint Hand Pull Tab, and Method D, Water Immersion in Appendix X1 of ASTM C1193. For joints with dissimilar substrates, verify adhesion to each substrate separately by extending cut along one side and verifying adhesion to opposite side. Repeat procedure for opposite side.
      d. Inspect joints for complete fill, absence of voids, and joint configuration complying with specified requirements. Record results in a log of field adhesion tests.
      e. Inspect tested joints and report on whether:
         1) 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.
         2) Sealants filled the joint cavities and are free of voids.
         3) Sealant dimensions and configurations comply with specified requirements.
      f. Record test results in a log of field adhesion tests. 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.

g. 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.

h. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other requirements will be 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.

i. Do not proceed with installation of elastomeric sealants over joint surfaces that have been painted, lacquered, waterproofed, or treated with water repellent or other treatment or coating unless a laboratory test for durability (adhesion), in compliance with FS TT-S-00227, has successfully demonstrated that sealant bond is not impaired by the coating or treatment. If laboratory test has not been performed or shows bond interference, remove coating or treatment from joint surfaces before installing sealant.

B. Water Leak Testing: Field test for water leaks as follows:

1. Flood the joint exposure with water directed from a 3/4-inch diameter garden hose, without nozzle, held perpendicular to wall face, two feet from joint and connected to water system with 30 psi minimum normal water pressure. Move stream of water along joint at an approximate rate of 20 feet per minute.
2. Test approximately five percent of total joint system, in locations that are typical of every joint condition, and that can be inspected easily for leakage on opposite face. Conduct test in presence of ENGINEER, who will determine actual percentage of joints to be tested and actual period of exposure to water from hose, based on extent of observed leakage or lack of observed leakage.
3. Where nature of observed leaks indicates potential of inadequate joint bond strength, ENGINEER may direct that additional testing be performed at a time when joints are fully cured, and before Substantial Completion.

3.5 ADJUSTING AND CLEANING

A. Where leaks and lack of adhesion are evident, replace sealant.

B. Clean adjacent surfaces of sealant and soiling resulting from the Work. Use solvent or cleaning agent recommended by sealant manufacturer. Leave all finish Work in neat, clean condition.

C. Protect sealants during construction so that they will be without deterioration, soiling, or damage at time of readiness for final payment of the Contract.

3.6 PROTECTION

A. During and after curing period, protect joint sealants 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 and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original Work.

+ + END OF SECTION + +

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, tools, equipment and incidentals as shown, specified and required to furnish and install hollow metal doors and frames.
   2. Extent of hollow metal doors and frames is shown.
   3. Types of products required include the following:
      a. Seamless, galvanized steel, paper honeycomb core, internally reinforced, flush doors.
      b. Seamless, galvanized steel, paper honeycomb core, internally reinforced, fire-rated, flush doors.
      c. Fully welded, galvanized steel, internally reinforced, door frames.
      d. Fully welded, galvanized steel, fire-rated, internally reinforced, door frames.
      e. Interior stick system window frames, sidelights and partitions.
      f. Fire-rated, interior stick system window frames, sidelights and partitions.
      g. Transoms and panels.
      h. Fire-rated transoms and panels.
      i. Removable panels.
      j. Removable transoms.
      k. Miscellaneous supports; special, supplemental and standard finish hardware reinforcements and preparation items; fasteners and accessories; all for high frequency, high-endurance use.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before the hollow metal doors and frames Work.
   2. Notify other contractors in advance of the installation of the hollow metal doors and frames to provide them with sufficient time for the installation of items included in their contracts that must be installed with, or before, the hollow metal doors and frames Work.

C. Related Sections:
   1. Section 06 10 53, Miscellaneous Rough Carpentry.
   2. Section 07 92 00, Joint Sealants.
   3. Section 08 71 00, Door Hardware.
   4. Section 08 81 00, Glass Glazing.

5. Section 09 91 00, Painting.
6. Section 13 34 19, Metal Building Systems.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
1. American National Standards Institute, (ANSI).
   a. ANSI in association with Steel Door Institute, ANSI/SDI 100, Steel Doors and Frames.
   b. ANSI in association with Door and Hardware Institute, ANSI/A115.1-A115.17/DHI, Specifications for Steel Door and Frame Preparation for Hardware.
   c. ANSI A224.1, Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
   d. ANSI A250.3, Test Procedure and Acceptance Criteria for Factory-Applied Finish Painted Steel Surfaces for Steel Doors and Frames.
   e. ANSI A250.4, Test Procedures and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcings.
   f. ANSI A250.5, Accelerated Physical Endurance Test Procedure for Steel Doors, Frames, and Frame Anchors.
   g. ANSI/NFPA 252, Fire Tests of Door Assemblies.
2. American Society for Testing and Materials, (ASTM).
   a. ASTM A 153/A 153M, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   b. ASTM A 366, Specification for Steel, Carbon, Cold-Rolled Sheet, Commercial Quality.
   c. ASTM A 653/A 653M, Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by The Hot-Dip Process.
   d. ASTM B 117, Practice for Operating Salt Spray (Fog) Apparatus.
   e. ASTM E 1408, Test Method for Laboratory Measurement of the Sound Transmission Loss of Door Panels and Door Systems.
3. Door and Hardware Institute, (DHI).
   a. DHI, Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames.
4. National Fire Protection Association, (NFPA).
   a. NFPA 80, Fire Doors and Fire Windows.
5. Steel Door Institute, (SDI/Door).
   a. SDI/Door 105, Erection Instructions for Steel Frames.
   b. SDI/Door 106, Standard Door Type Nomenclature.
   c. SDI/Door 112, Zinc-Coated (Galvanized/Galvannealed) Standard Steel Doors and Frames.
   d. SDI/Door 117, Manufacturing Tolerances Standard Steel Doors and Frames.
   e. SDI/Door 122, Installation and Troubleshooting Guide for Standard Steel Doors and Frames.

f. SDI/Door 128, Guidelines for Acoustical Performance of Standard Steel Doors and Frames.

6. The Society for Protective Coatings, (SSPC).
   a. SSPC Paint 2, Cold Phosphate Surface Treatment.
   b. SSPC Paint 27, Basic Zinc Chromate-Vinyl Butyral Wash Primer.
7. Underwriters' Laboratories Inc., (UL).
   a. UL 10B, Fire Tests of Door Assemblies.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications:
   1. Manufacturer shall have a minimum of five years experience producing substantially similar equipment and shall be able to show evidence of at least five installations in satisfactory operation for at least five years.
   2. Provide hollow metal doors, frames, and accessories manufactured by a single firm specializing in the production of this type of Work and complying with specified standards of ANSI, NFPA, SDI and UL.
   3. Provide hollow metal doors and frames from a manufacturer who is a member of SDI.

B. Component Supply and Compatibility:
   1. Obtain all equipment included in this Section regardless of the component manufacturer from a single hollow metal doors and frames manufacturer.
   2. The hollow metal doors and frames equipment manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
   3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the hollow metal doors and frames manufacturer.

C. Regulatory Requirements:
   1. Fire-Resistance-Rated Assemblies: Wherever a fire-resistance classification is shown or scheduled for hollow metal doors and frames (3-hour, 1-1/2-hour, and similar designations), provide fire-resistance-rated hollow metal doors and frames tested as a fire door assembly, complete with type of fire door hardware to be used.
   2. Identify each fire-resistance-rated door and frame with recognized testing laboratory labels, indicating applicable fire-resistance-rating of both door and frame. Provide fire-resistance-rated doors and frames with metal labels permanently fastened to door and frame. Labels shall display all UL required information.
   3. Temperature Rise Rating: Wherever a temperature rise rating is required by the building code, provide doors for fire-resistance-ratings shown and in accordance with UL 10B.
      a. For a UL 3-hour (A) classification, provide doors with a temperature rise rating of not more than 250°F maximum to 30 minutes of exposure.

b. For a UL 1-1/2-hour (B) classification, provide doors with a temperature rise rating of not more than 450°F or 650°F maximum to 30 minutes of exposure.

4. Door and frame assemblies shall comply with NFPA 80, and as specified. Modify specified hollow metal door and frame system components to comply with requirements of governing jurisdictions for fire-resistance-rated construction.
5. Oversize Assemblies: Wherever hollow metal assemblies are larger than size limitations established by ANSI/NFPA 252 and UL10B provide manufacturer's certification that assembly has been constructed with materials and methods equivalent to labeled construction.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Fabrication and installation drawings of hollow metal doors and frames. Include details of each frame type, elevations of each door type, conditions at openings, details of construction, location and installation requirements of finish hardware and reinforcements, and details of joints, connections and every composite member. Show all door and frame reinforcements, including welds, plate lengths, locations and gauges, identified for each component of finish hardware specified in Section 08 71 00, Door Hardware.
      b. Provide a schedule of doors and frames using same reference numbers for details and openings as those shown.
   2. Samples:
      a. ENGINEER reserves the right to require samples showing fabrication techniques and workmanships of all component parts, and the detailing and fabrication of accessories and auxiliary items for all door and frame Work, before fabrication of the Work proceeds.

B. Informational Submittals: Submit the following:
   1. Certificates:
      a. Certification of Labeled Construction for fire-resistance-rated doors and frames.
      b. Oversize Fire-resistance-rated Doors and Frames: Submit for approval UL certification for oversized fire-resistance-rated doors and frames verifying that each assembly has been constructed with materials and methods equivalent to requirements for labeled construction.
   2. Test and Evaluation Reports:
      a. Test reports indicating compliance with ANSI A250.4 and ANSI A250.5.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:

1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices which are to be embedded in cast-in-place concrete in ample time to prevent delay of that Work.
2. Deliver hollow metal doors and frames cartoned or crated to provide protection during transit and job storage.

B. Storage and Protection:
1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
2. Store doors and frames at the Site under cover.
3. Place units up off floors in a manner that will prevent rust and damage.
4. Avoid the use of non-vented plastic or canvas shelters, which could create a humidity chamber. If cardboard wrapper on the door becomes wet, remove the carton immediately.
5. Provide a 1/4-inch space between stacked doors to promote air circulation.

C. Acceptance at Site:
1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify ENGINEER, in writing, if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Design Criteria:
1. Door Classification: Provide hollow metal doors of Grades and Models in accordance with ANSI/SDI 100, and ANSI A250.5 as follows:
   a. Level II, Heavy-Duty, 1-3/4-inches thick (Level B); Model 2A, seamless design.

B. Details of Construction:
1. Provide doors of two outer stretcher-leveled sheets, 14-gauge minimum. Construct doors with smooth, flush surfaces without visible joints or seams on exposed faces or edges, except around glazed or louvered panel inserts. No fillers shall be used. Provide weep hole openings in the bottom of exterior doors to permit the escape of entrapped moisture.
2. Reinforce inside of doors with honeycomb core completely filling the inside of the door and laminated to the inside of both face panels with an adhesive. The honeycomb material shall have a crushing strength not less than 6,000 pounds per square foot and the lamination shall withstand not less than 1,100 pounds per square foot in shear.

C. Frame Construction:
   1. Form frames of cold-rolled sheet material, 14-gauge minimum. Provide seamless frames for all Work, unless specifically specified and shown as permitting exposed fasteners.
   2. Provide hollow metal frames for doors, transoms, side-lights, borrowed lights, and other openings of size and profile as shown or specified.
   3. Provide stick system for interior window frames and partitions, assembled as borrowed lights, sidelights, transom frames, or interior windows assembled from components of same gauge, and of similar profiles to standard hollow metal door frames, as shown.

2.2 MANUFACTURERS

A. Products and Manufacturers: Provide one of the following:
   1. Series CH with Series F 14 Frames and DW 14 Frames by Pioneer Industries, Incorporated.
   2. Or equal.

2.3 MATERIALS

A. Door Faces and Frames: Zinc-coated, cold-rolled carbon steel sheets of commercial quality, complying with ASTM A 366, and ASTM A 653/A 653M, G 60 zinc coating, mill-phosphatized.

B. Honeycomb Core: Phenolic resin-impregnated, nominal 1-inch hexagonal cell size, one piece, Kraft fiber core board, with 42 psi minimum crushing strength.

C. Supports and Anchors: Formed sheet metal, hot-dip galvanized after fabrication complying with ASTM A 153/A 153M, Class B, and in compliance with requirements of ANSI A250.5. Provide supports and anchors as follows:
   1. Jamb Anchors: 16-gauge minimum, and of the following types:
      a. Masonry Construction: Adjustable, corrugated or perforated, T-shaped to suit frame size with leg not less than 2-inches wide by 10-inches long.
      b. In-Place Concrete or Masonry Construction: 3/8-inch concealed bolts and expansion shields or inserts.
      c. Gypsum Wallboard and Steel Stud Construction: Two-piece compression anchors with exposed compression fasteners.
   2. Floor and Head Anchors: 14-gauge minimum, and of the following types:
      a. Monolithic Concrete Slabs: Clip-type, with two holes to receive fasteners, welded to bottom of jambs and mullions.
      b. Separate Topping Concrete Slabs: Adjustable-type with extension clips, allowing not less than 2-inches height adjustment. Terminate bottom of frames at finish floor surface.

D. Inserts, Bolts and Fasteners: Sheet metal hot-dip galvanized complying with ASTM A 153/A 153M, Class C or D as applicable.

E. Miscellaneous Accessories:
   1. Head Strut Supports: 3/8-inch by 2-inch hot-dipped galvanized steel.
   2. Structural Reinforcing Members: Provide structural reinforcing members as part of frame assembly, where shown at mullions, transoms, or other locations that are to be built into frame.
   3. Head Reinforcing: For frames over 4 feet-0 inches wide, in masonry openings, provide continuous steel channel or angle stiffener, not less than 12-gauge for full width of opening, welded to back of frame at head.
   4. Steel Spreader Bars: Provide removable spreader bar across bottom of frames, tack welded to jambs and mullions.
   5. Plaster Guards: 26-gauge minimum galvanized steel.
   6. Louvers, Stops and Moldings: 16-gauge minimum, cold-rolled, hot-dipped galvanized, formed sheet metal.
   7. Insect Screen: 14 by 18 bronze wire mesh in a rigid, formed metal frame.

2.4 FABRICATION

A. General:
   1. Fabricate hollow metal units to be rigid, neat in appearance and free for defects, warp or buckle. Accurately form metal to required sizes and profiles.
   2. Wherever practicable, fit and assemble units in the manufacturer's plant. Clearly identify Work that cannot be permanently factory-assembled before shipment, to assure proper assembly at the Site. Weld exposed joints continuously, grind, dress, and make smooth, flush and invisible. Filler to conceal manufacturing defects shall not be acceptable.
   3. Exposed Fasteners: Unless otherwise shown or specified, do not use exposed fasteners in the Work. Where exposed fasteners are shown or specified, provide countersunk flat Phillips or Jackson heads for exposed screws and bolts.

B. Doors:
   1. Fabricate all hollow metal doors and panels in compliance with ANSI A250.5.
   2. Fabricate all doors with flush top and bottom closing channel, without exposed fasteners. Reinforce tops and bottoms of doors with inverted, flush-mounted, minimum 20-gauge, horizontal steel channels fastened to internal reinforcement channel and with 20-gauge closing plate spot-welded to closure channel. Close top and bottom edges to provide weather seal, as integral part of door construction or by addition of inverted steel channels and plates.
   3. Hollow Metal Panels:
      a. Fabricate hollow metal panels of the same materials, construction, and finish as specified for hollow metal doors.
      b. Provide astragal integral with top of door where shown.
   4. Provide dutch doors with shelves as shown.
   5. Edge profiles shall be provided on both stiles of doors beveled 1/8 inch in 2 inches.

C. Frame Construction:
   1. Fabricate all hollow metal frames in compliance with ANSI A250.8 and as specified.
   2. Form frames of cold-rolled sheet material, 14-gauge minimum. Provide seamless frames for all Work, unless specifically specified and shown as permitting exposed fasteners.
   3. Provide hollow metal frames for doors, transoms, side-lights, borrowed lights, and other openings of size and profile as shown or specified.
   4. Provide stick system for interior window frames and partitions, assembled as borrowed lights, sidelights, transom frames, or interior windows assembled from components of same gauge, and of similar profiles to standard hollow metal door frames, as shown.
   5. Fabricate frames with reinforced, mitered corners that are continuously arc-welded for the full depth and width of the frame, with bottom spreader bar; except provide drywall frames as specified.
   6. Grind all exposed welds flush and smooth.
   7. Head Reinforcing: Where installed in masonry, leave vertical mullions in frames open at the top so they can be filled with grout.
   8. Head Strut Supports: Provide vertical steel struts extending from top of frame at each jamb to supporting construction above, unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable bolted anchorage to frame jamb members.
   9. Jamb Anchors: 16-gauge minimum, and of the following types:
      a. Masonry Construction: Adjustable, corrugated or perforated, T-shaped to suit frame size with leg not less than 2-inches wide by 10-inches long.
      b. In-Place Concrete or Masonry Construction: 3/8-inch concealed bolts and expansion shields or inserts.
      c. Gypsum Wallboard and Steel Stud Construction: Two-piece compression anchors with exposed compression fasteners.
   10. Rubber Door Silencers: Drill stop to receive three silencers on single-door frames and four silencers on double-door frames. Install plastic plugs to keep holes clear during construction.
   11. Plaster Guards: Provide manufacturer's standard plaster guards or dust cover boxes.
   12. Electrical Requirements:
      a. General: Coordination all electrical requirements for frames. Make provisions for installation of electrical items arranged so that wiring can be readily removed and replaced.
         1) Provide cutouts and reinforcements required for metal door frame to accept electric components.
         2) Frame with Electrical Hinges: Weld UL listed grout guard cover box welded over center hinge reinforcing. Top or bottom hinge Locations are not permitted.
         3) Provide cutouts and reinforcements required to accept security system components.

4) Refer to Section 08 71 00 for electrified hardware items.

D. Finish Hardware Preparation:
1. General:
a. Prepare hollow metal units to receive mortised and concealed finish hardware, including cutouts, reinforcing, drilling and tapping in accordance with approved Finish Hardware Schedule and templates provided by finish hardware supplier and as specified. Comply with applicable requirements of ANSI/DHI A115.1 to A115.17 and ANSI A250.4. Refer to Section 08 71 00, Door Hardware.
b. Obtain approved hardware schedule, hardware templates, and samples of finish hardware where necessary to ensure correct detailing and fabrication of the hollow metal doors and frames, from finish hardware supplier.
2. Doors:
a. Preparation includes sinkages, and cut-outs for mortised and concealed finish hardware and reinforcements for both concealed and surface-applied finish hardware.
b. Drill and tap mortise reinforcements at factory, using templates.
c. Detail and fabricate reinforcements with concealed connections designed to develop full strength of reinforcements for high-frequency applications.
d. Reinforce doors for required finish hardware, with minimum gauges of reinforcements provided as follows:
1) Hinges: Steel plate 3/16-inches thick by 1-1/2-inches wide by 6-inches longer than hinge and secured by not less than six spot or projection welds with top hinge further reinforced with a high-frequency back-up reinforcement.
2) Mortise Locksets and Dead Bolts: 12-gauge steel sheet, secured with not less than four spot or projection welds.
3) Cylinder Locks: 12-gauge steel sheet, secured with not less than two spot or projection welds.
4) Flush Bolts: 12-gauge steel sheet, secured with not less than two spot or projection welds.
5) Surface-Applied Closers and Overhead Stops: 3/16-inch steel plate, not less than 10-inches long, secured with not less than six spot or projection welds.
6) Push Plates and Bars: 16-gauge steel sheet secured with not less than two spot or projection welds.
7) Surface Panic Devices: 16-gauge sheet steel secured with not less than two spot or projection welds.
8) Automatic Door Bottoms: Reinforce for mortise-type units with 14-gauge steel, and 16-gauge for surface-applied units.
3. Frames:
a. Reinforce frames for required finish hardware with minimum gauges as follows:

1) Hinges and Pivots: Special full width of frame, 3/16-inch thick steel plate by 8-inches longer than hinge, secured to both rabbets by not less than twelve spot or projection welds.
2) Strike Plate Clips: 10-gauge steel plate by 1-1/2-inches wide by 3-inches long with mortar guard boxout secured with not less than six spot or projection welds.
3) Surface-Applied Closers: 3/16-inch steel plate, secured with not less than six spot or projection welds. Coordinate closer function and presence of overhead stops and weather-stripping, with location of reinforcement plate.
4) Concealed Closers: Removable steel access plate, 12-gauge internal reinforcement of size and shape required, and enclosing housing to keep closer pocket free of mortar or other materials.

E. Door Louvers:
1. Fabricate louvers and mount flush into doors without overlapping moldings on surface of door-facing sheets. Provide internal support as recommended by louver manufacturer. Provide profile as shown.
2. Interior Louvers: Sightproof, stationary type, constructed of inverted chevron-shaped blades and U-shaped frames, not less than 1-3/8-inches thick, formed of 18-gauge cold-rolled steel. Space louver blades not more than 3-inches on center. Assemble units by welding.
3. Exterior Louvers: Fabricate units with stationary, weatherproof Z-shaped blades and U-shaped frames, not less than 1-3/8-inch thick. Space louver blades not more than 1-1/2-inches on center. Assemble units by welding. Provide removable insect screens on the interior side of the frame.
4. Louvers for Fire-Resistance-Rated Openings: Provide tightly fitted automatic closing, operable blades, equipped with fusible links, arranged so that metal overlaps metal at every joint, UL approved.

F. Stops and Moldings:
1. Provide stops and moldings around solid, glazed and louvered panels in hollow metal units and in frames to receive glass.
2. Fabricate fixed stops and moldings integral with frame. Provide fixed stops on inside of hollow metal units exposed to exterior and on corridor side of interior units.
3. Provide removable stops and molds at other locations, formed of not less than galvanized 20-gauge steel sheets. Secure with countersunk machine screws spaced uniformly not more than 12 inches on center. Form corners with butted hairline joints.
4. Coordinate width of rabbet between fixed and removable stops with type of glass or panel and type of installation indicated. Refer to Section 08 81 00, Glass Glazing.

2.5 SHOP PAINTING

A. Clean, treat and paint exposed surfaces of fabricated hollow metal units, including galvanized surfaces.

B. Clean steel surfaces of mill scale, rust, oil, grease, dirt and other foreign materials before the application of the shop coat of paint.

C. Apply pretreatment to cleaned metal surfaces, using cold phosphate solution (SSPC Paint 2), or basic zinc chromate-vinyl butyral solution (SSPC Paint 27).

D. Refer to Section 09 91 00, Painting, for field-applied primer and finish paint for exterior or interior exposed ferrous, non-ferrous, or galvanized surfaces.

E. Apply shop-coat of prime paint within time limits recommended by pretreatment manufacturer. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 1.5-mils.

F. Finish shall be rust inhibitive primer capable of passing a 500-hour salt spray and a 1,000-hour humidity test in accordance with ASTM B 117 as certified by an independent laboratory.

2.6 SOURCE QUALITY CONTROL

A. After Shop Drawings approval, manufacturer shall not make any further detailing, fabrication or changes to approved methods of support and anchorage, nor shall doors and frames be brought to the Site, which do not conform, in all ways, to performance criteria specified.

B. Allowable Tolerances: Provide door and frame manufacturing tolerances in compliance with SDI 117 and as follows:
   1. Nominal Clearance between Door and Frame Head and Jamb: 1/8-inch.
   2. Nominal Clearance between Meeting Edges of Pairs of Doors: 1/8-inch.
   3. Nominal Clearance at Bottom of Door: 3/4-inch.
   4. Nominal Clearance between Face of Door and Door Stop: 1/16-inch.
   5. Provide all Work plumb and true to adjoining surfaces with all miters and copes accurately formed.
   6. Provide completely water and vapor tight joints.

PART 3 - EXECUTION

3.1 INSPECTION

A. CONTRACTOR shall examine the substrate and conditions under which hollow metal doors and frames are to be installed and notify ENGINEER, in writing, of any

conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

B. Frames that are bowed, twisted or otherwise unacceptable shall be removed from the Site and replaced with properly constructed frames.

3.2 PREPARATION

A. Drilling and tapping for surface-applied, finish hardware may be done at Site.

B. Protective Coating: Protect inside, concealed, faces of door frames in plaster or masonry construction using fibered asphalt emulsion coating. Apply over shop primer approximately 1/8 inches thick and allow to dry before installation.

3.3 INSTALLATION

A. Install hollow metal units and accessories in accordance with approved Shop Drawings, SDI 105 and as shown and specified.
   1. Do not install doors and frames until all the Work, which could damage doors and frames, has been completed.
   2. Provide temporary doors until construction sequencing allows installation of permanent doors and frames.
   3. Do not proceed with the installation of permanent hollow metal doors until CONTRACTOR can provide finished Work complying with all requirements of these Specifications.
   4. Protect built-in frame Work with temporary wood protection.

B. Placing Frames:
   1. Place frames at fire-rated openings in accordance with NFPA 80.
   2. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces and spreaders leaving surfaces smooth and undamaged. Remove spreader bars only after frames have been properly set and secured.
   3. Make field splices in frames as detailed on approved Shop Drawings, welded and finished to match factory work.

C. Setting Masonry Anchorage Devices:
   1. In masonry construction, building in of anchors and grouting of frames is included in Section 04 05 05, Unit Masonry Construction.
   2. Set anchorage devices opposite each anchor location, in accordance with details on approved Shop Drawings and anchorage device manufacturer's instructions as follows:
      a. Masonry Walls: Install at least three jamb anchors per jamb up to 7 feet-6 inches height; four anchors up to 8 feet-0 inch jamb height; one

additional anchor for each 2 foot-0 inch or fraction thereof over 8 feet-0 inch height.

b. Cast-In-Place Concrete and Existing Rough Openings: Anchor frame jambs with concealed bolts into expansion shields or inserts at 6 inches from top and bottom and 2 foot-0 inches on center. Apply removable stop to cover anchor bolts.

c. Structural Steel: Secure frames to structural steel framing using machine bolts inserted through tubular steel pipe sleeves reinforcement concealed in hollow metal frames at 6 inches from top and bottom and 2 foot-0 inches on center. Apply removable stop to cover anchor bolts.

d. Steel Stud Construction: Secure knocked-down-type drywall frames to gypsum wallboard metal studs using compression anchor assemblies. Install at least three jamb anchors per jamb up to 7 feet-6 inches height; four anchors up to 8 feet-0 inch jamb height; one additional anchor for each 2 foot-0 inch or fraction thereof over 8 feet-0 inch height.

3. Floor anchors may be set with powder-actuated fasteners instead of masonry anchorage devices and machine screws, if so indicated on approved Shop Drawings.

D. Door Installation:

1. Fit hollow metal doors accurately in their respective frames, with the following clearances:

a. Jambs and Head: 3/32-inch.

b. Meeting Edges, Pairs of Doors: 1/8-inch.

c. Bottom: 3/4-inch, where no threshold or carpet.

d. Bottom: At threshold or carpet, 1/8-inch.

2. Place fire-resistance-rated doors with clearances as specified in NFPA 80.

3. Finish hardware installation is specified under Section 08 71 00, Door Hardware. Locate finish hardware as shown on approved Shop Drawings, in accordance with hardware templates provided by finish hardware manufacturers and in accordance with Door and Hardware Institute, Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames.

3.4 ADJUSTMENT AND CLEANING

A. Check and readjust operating finish hardware items in hollow metal door and frame Work just prior to final inspection. Leave Work in complete and proper operating conditions.

B. Where problems of installation or damage are cause for rejection of hollow metal door and frame Work, consult SDI 122 and the recommendations of the hollow metal door and frame manufacturer, for suggestions concerning required adjustments in the Work. Submit recommendations to ENGINEER for approval. Replace and repair unacceptable Work, as directed by ENGINEER, so that there will be no doubt as to the acceptability of the Work at the time of Substantial Completion.

C. Prime Coat Touch-Up: Immediately after installation, sand smooth all rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.

D. Protection: Protect installed hollow metal doors and frames against damage from other construction activities.

+ + END OF SECTION + +

SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, tools, equipment and incidentals as shown, specified and required to furnish and install finish hardware. Furnish finish hardware for all doors in compliance with these Specifications herein.
   2. Extent of finish hardware is specified. Finish hardware is defined to include all items known commercially as finish hardware, except special types of unique and non-matching hardware specified in the same Section as the door and doorframe.
   3. Types of products required include the following:
      a. Mortise hinges.
      b. High-security mortise locksets.
      c. High-security mortise latchsets.
      d. Panic exit devices.
      e. Overhead, surface-mounted, door closers.
      f. Heavy-duty, concealed, adjustable, overhead holders and stops.
      g. Flush bolts and automatic flush bolts.
      h. Coordinators.
      i. Astragals.
      j. Dust-proof strikes.
      k. Door pulls, push plates and protection armor plate.
      l. Stripping and seals.
      m. Thresholds.
      n. Silencers.
      o. Floor stops.
      p. Wall stops.
      q. Protection Armor.
      r. Miscellaneous items and accessories for a complete installation functioning in compliance with the requirements of governing authorities having jurisdiction at the Site.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with, or before, the finish hardware.
   2. Notify other contractors in advance of the installation of the door hardware to provide them with sufficient time for the installation of items included in their contracts that must be installed with, or before, the door hardware.

3. Coordinate the Work of other Sections to provide clearances and accurate positioning of recessed or cast-in-place items.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. American National Standards Institute, (ANSI).
      a. ANSI A117.1, Accessible and Usable Buildings and Facilities.
   2. American National Standards Institute, (ANSI), in association with Builders Hardware Manufacturers' Association, (ANSI/BHMA).
      a. ANSI/BHMA A156.1, Butts and Hinges.
      b. ANSI/BHMA A156.3, Exit Devices.
      c. ANSI/BHMA A156.4, Door Controls - Closers.
      d. ANSI/BHMA A156.6, Architectural Door Trim.
      e. ANSI/BHMA A156.7, Template Hinge Dimensions.
      f. ANSI/BHMA A156.8, Door Controls - Overhead Stops and Holders.
      g. ANSI/BHMA A156.13, Mortise Locks and Latches, Series 1000.
      h. ANSI/BHMA A156.16, American National Standard for Auxiliary Hardware.
      i. ANSI/BHMA A156.18, Hardware - Materials and Finishes.
      j. ANSI/BHMA A156.21, Thresholds.
      k. ANSI/BHMA A156.22, Door Gasketing and Edge Seal Systems.
   3. ANSI, in association with Door and Hardware Institute, (ANSI/DHI).
      a. ANSI/DHI A115.1, Preparation of Mortise Locks in 1-3/8-inch and 1-3/4-inch Standard Steel Doors and Frames.
   4. ANSI, in association with National Fire Protection Association, (ANSI/NFPA).
      a. ANSI/NFPA 252, Standard Methods of Fire Tests of Door Assemblies.
   5. ANSI, in association with Underwriters' Laboratories, Inc., (UL).
      a. UL 10B, Fire Tests of Door Assemblies.
   6. The Americans with Disabilities Act of 1990 (Public Law 101-336), Appendix A to Title 28 Code of Federal Regulations Part 36 (Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities - ADAAG).
   7. Door and Hardware Institute, (DHI).
      a. DHI, Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames.
      b. DHI, Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames.
      c. DHI, Sequencing and Format for the Hardware Schedule.
   8. Hollow Metal Manufacturers Association, Division of National Association of Architectural Metal Manufacturers, (HMMA).
      a. HMMA 830, Hardware Preparation and Locations for Hollow Metal Doors and Frames.
   9. National Fire Protection Association, (NFPA).
      a. NFPA 80, Fire Doors and Fire Windows.
   10. Steel Door Institute, (SDI).
      a. SDI 109, Hardware for Standard Steel Doors and Frames.
      b. SDI 118, Basic Fire Door Requirements.

11. Underwriters' Laboratories, Inc., (UL).
    a. UL 305, Panic Hardware.
    b. UL, Building Materials Directory.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications:
   1. Provide finish hardware and accessories manufactured by firms specializing in the production of this type of Work and complying with specified standards of ANSI, BHMA, DHI, NFPA, HMMA, SDI and UL.
   2. Provide finish hardware from manufacturers who are members of BHMA and participate in BHMA certification programs.

B. Installer's Qualifications:
   1. The finish hardware installer shall have in his employ an architectural hardware consultant. The architectural hardware consultant shall be a member of the Door and Hardware Institute, (DHI), who has passed the DHI certification examine and successfully completed an apprenticeship program. The architectural hardware consultant shall be responsible for preparing finish hardware schedules and Shop Drawings and be present at the Site for the purpose of checking and supervising the Work of the installer during the time of installation and adjustment of the finish hardware Work, and shall prepare a written field report on status of completed finish hardware installation as specified.
   2. Submit name and qualifications of the installer to ENGINEER.

C. Requirements of Regulatory Agencies:
   1. Provide finish hardware for fire-resistance-rated openings in compliance with NFPA 80.
   2. Provide only finish hardware that has been tested, listed and labeled by UL for the types and sizes of doors required, and complies with the requirements of the door and doorframe labels.
   3. Modify features of finish hardware items specified, and provide additional accessories and features as required to meet UL and NFPA requirements, at no additional cost to the OWNER.

D. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100 by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Codes: Comply with applicable requirements of codes.

F. Source Quality Control:
   1. Obtain each type of finish hardware item from only one manufacturer.
   2. Provide finish hardware schedule, for submission to, and for approval by, ENGINEER, prepared in compliance with DHI standards.
   3. Comply with specified BHMA standards.

1.4 SUBMITTALS

A. Samples: Submit the following:
   1. Actual unit of each finish hardware item specified incorporating all standard and special features and finishes specified, demonstrated and identified by manufacturer's representative to ENGINEER. Samples shall be presented at time of Shop Drawing submittal, as ENGINEER will not review or approve Shop Drawings without concurrent sample submissions.
   2. Approved samples may be incorporated into the finish hardware Work.
   3. ENGINEER's review will be for appearance and for general compliance with required features. Compliance with all other requirements is the responsibility of CONTRACTOR.

B. Shop Drawings: Submit the following:
   1. Copies of manufacturer's data for each item of finish hardware. Include whatever information may be required to show compliance with specified requirements, and include instructions for installation and for maintenance of operating parts and exposed finishes. Include mounting heights and locations for each item of finish hardware. Provide ENGINEER with latest complete technical catalogue of all available finish hardware manufactured by proposed manufacturers, even if manufacturer specified by ENGINEER is submitted by CONTRACTOR to perform the Work. Furnish templates to fabricators of other Work, which is to receive finish hardware.
   2. Copies of the Finish Hardware Schedule in the manner and format specified, complying with the actual construction Progress Schedule requirements (for each draft). Include explanation of abbreviations, symbols, and codes used to present scheduled information.
      a. Prepare and submit Finish Hardware Schedule in compliance with HDI standards.
   3. Based on the finish hardware requirements specified, organize the final Finish Hardware Schedule into "hardware sets," indicating complete designation of every item required for each door or opening. Furnish initial draft of schedule at the earliest possible date, in order to facilitate the fabrication of other Work (such as hollow metal frames) which may be critical in the Project Schedule. Furnish final draft of schedule after Samples, manufacturer's data sheets, coordination with Shop Drawings for other Work, delivery schedules and similar information have been completed and accepted.
   4. Include a separate key schedule, showing clearly how CITY's final instructions on keying of locks have been fulfilled.
   5. Finish Hardware Schedules are intended for coordination of the Work. Review and acceptance by ENGINEER does not relieve CONTRACTOR of responsibility to fulfill the requirements as shown and specified.
   6. Installer's qualifications.
   7. Maintenance Manual: Upon completion of the Work, furnish five copies of detailed maintenance manuals, including the following information:

a. Product name and manufacturer.
b. Name, address, e-mail address and telephone number of manufacturer and local distributor.
c. Detailed procedure for routine maintenance and cleaning.
d. Detailed procedures for repairs such as dents, scratches and staining.
e. Parts identification manual and maintenance manuals for each piece of finish hardware.

C. Test Reports: Submit for approval certified independent laboratory test reports for BHMA certification program and certification tests for each type of product specified.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:
1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices which are to be embedded in cast-in-place concrete in ample time to prevent delay of that Work.
2. Deliver all items of finish hardware in manufacturer's original, undamaged packages, bearing accurate representation of the item within each package.
3. Pack each piece of finish hardware separately, complete with screws, keying, instructions and templates, tagged to correspond with items submitted on approved Shop Drawings and as specified.

B. Storage and Protection:
1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
2. Provide secure storage area for finish hardware items, secured by locks and accessible only to finish hardware installer, ENGINEER and CONTRACTOR.
3. Store finish hardware in manufacturers' original packages.

C. Acceptance at Site:
1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify ENGINEER, in writing, if any loss or damage exists to equipment or components. Items that arrive in a damaged condition shall be removed from the Site and not offered again for acceptance. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Description:
   1. Where the finish, shape, size, fire-resistance-rating, frequency of use, or function of a member receiving finish hardware is such as to prevent, or make unsuitable, the types of finish hardware specified, furnish similar types having as nearly as practicable the same operation but of type or kind more appropriate to the design intension and requirements of governing authorities having jurisdiction at the Site. Clearly identify and highlight to ENGINEER all such required modifications on Shop Drawings submitted for approval.
   2. If finish hardware for any location is not specified, provide finish hardware equal in design and quality to adjacent finish hardware specified for comparable openings at no additional cost to DEPARTMENT.
   3. Furnish finish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements, as necessary for proper installation and function.
   4. Unless otherwise specified, comply with DHI, Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames and Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames.

2.2 DETAILS OF CONSTRUCTION

A. General:
   1. Hand of Door: The Drawings show the swing or hand of each door leaf (left, right, reverse bevel, etc.). Furnish each item of finish hardware for proper installation and operation of the door swing as shown.
   2. Manufacturer's Name Plate: Do not use manufacturer's products which have manufacturer's name or trade name displayed in a visible location (omit removable nameplates), except in conjunction with labels required by governing authorities having jurisdiction at the Site.
   3. Base Metals: Produce finish hardware units of the basic metal and forming method specified, using the manufacturer's standard metal alloy, composition, temper and hardness. Do not substitute materials or forming methods for those specified.
   4. Fasteners: Manufacture finish hardware to conform to published templates, generally prepared for machine screw installation. Do not provide finish hardware, which has been prepared for self-tapping sheet metal screws, except as specifically indicated.
   5. Furnish screws for installation, with each finish hardware item. Provide Phillips flat-head screws except as otherwise specified. Finish exposed (exposed under any condition) screws to match the hardware finish or, if exposed in surfaces on

other Work, to match the finish of such other Work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.

6. Provide fasteners which are compatible with both the unit fastened and the substrate, and which will not cause corrosion or deterioration of finish hardware, base material or fastener.
7. Provide concealed fasteners for finish hardware units, which are not exposed when the door is closed, except to the extent no standard manufacturer units of the type specified are available with concealed fasteners. Do not use through bolts for installation where the bolt head or the nut on the opposite face is exposed in other Work under any condition, except where it is not possible to adequately reinforce the Work and use machine screws or concealed fasteners of another standard type to satisfactorily avoid the use of through bolts.
8. Tools for Maintenance: Furnish two complete sets of specialized tools as required for CITY's continued adjustment, maintenance, removal and replacement of finish hardware.

B. Mortise Hinges:
1. Templates and Screws: Provide only template-produced units.
2. Base Metal: Except as otherwise specified, fabricate hinges from stainless steel and finish to match the latch and lock set.
3. Number of Hinges: Provide three hinges on each door leaf of less than 60-inches in height; provide one additional hinge for next 30-inches of door height or fraction thereof; provide two additional hinges for each 30-inches, or fraction thereof, for doors above 90-inches tall.
4. Hinge Size: Except as otherwise specified or as required to comply with UL and NFPA, provide hinges of the following sizes:
   a. Interior Doors:
      1) Average Use, Maximum 36-Inches Wide: 4-1/2-inch standard weight (0.134-inches).
      2) Heavy Use, Maximum 36-Inches Wide: 4-1/2-inch heavyweight (0.180-inches).
   b. Exterior Doors, Maximum 36-Inches Wide: 4-1/2-inch heavyweight (0.180-inch).
   c. Wide Exterior and Interior Doors:
      1) Maximum 48-inches wide: 5-inch heavyweight (0.190-inch).
      2) Over 48-inches wide: 6-inch heavy weight (0.203-inch).
5. Types of Hinges: Provide full-mortise type, ball-bearing hinges, swaged for mortise applications, inner leaf beveled, square cornered, unless manufacturer's recommendations indicate that half-mortise, half-surface, full-surface or other type should be used for the frame and door type or condition.
6. Hinge Pins: Except as otherwise specified, provide hinge pins as follows:
   a. Pins: Stainless steel.
   b. Exterior Doors: Non-removable pins. Provide setscrew in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed.
   c. Tips: Slope ends of hinge barrel.

7. Conform to ANSI/BHMA A156.7.
8. Comply with UL, List of Inspected Fire Protection Equipment and Materials and NFPA 80 requirements.
9. Electrified Functions for Hinges: (Reference Door Schedule on drawing A03-16 for doors that require Access Control). Comply with the following:
    a. Power Transfer: Concealed PTFE-jacketed wires, secured at each leaf and continuous through hinge knuckle.
    b. Monitoring: Concealed electrical monitoring switch.
    c. Power Transfer and Monitoring: Concealed PTFE-jacketed wires, secured at each leaf and continuous through hinge knuckle, and with concealed electrical monitoring switch.
10. Products and Manufacturers: Provide one of the following:
    a. FBB 199 and FBB 191 by Stanley Commercial Hardware, Division of The Stanley Works.
    b. T4B3386 and TB3313 by McKinney Products Company, Division of ESSEX Industries, Incorporated.
    c. Or equal.

C. High-Security Mortise Locks and Latch Sets:
1. Strikes: Provide manufacturer's standard wrought box strike, for each location and use shown. Provide stainless steel curved lip strikes, unless otherwise recommended by manufacturer, finished to match lock or latch set trim.
2. Lock Throw: Provide minimum of 3/4-inch anti-friction latch bolt and 1-inch dead bolt throw. Comply with UL requirements for throw of latch bolts and deadbolts on fire-resistance-rated openings.
3. Materials: Provide the following features and materials:
    a. Latch Bolt: Two-piece; mechanical; anti-friction, stainless steel.
    b. Dead Bolt: One-piece, stainless steel with two enclosed hardened-steel roller armor pins.
    c. Case: Wrought steel, zinc dichromatized.
    d. Cylinders: High-security; brass; pick- and drill-resistant; ANSI/BHMA A156.5 - E09211A.
    e. Armor Front: 8-inches by 1-1/4-inches wide, minimum; steel.
    f. Escutcheon: 8-inches by 2-1/2-inches wide by 3/16-inches thick, minimum; stainless steel, US 32D.
    g. Hubs: Sintered steel, copper infiltrated.
    h. Lever with Stop Pin: Brass, plated to match stainless steel, with additional built-in stop to prevent over-torqueing of lever.
    i. All components shall be of marine quality, wherever possible.
4. Backset: 2-3/4-inches.
5. Modify specified locks and latches to comply with UL, Building Materials Directory, and List of Inspected Fire Protection Equipment and Materials and NFPA 80 requirements.
6. Finish: US 32D satin.
7. Conform to ANSI/BHMA A156.13, Series 1000, Security Grade 1.
8. Products and Manufacturers: Provide one of the following:

a. High Security SL8800 Mortise Lockset with Augusta - AUSL Lever Handles and Trim by Yale Commercial Locks and Hardware, an ASSA ABLOY Group company.
b. ML2000 Series Mortise Lockset and with Newport NSM Lever Handles and Trim by Corbin Russwin Architectural Hardware, an ASSA ABLOY Group Company.
c. Or equal.

D. Panic Exit Devices:
1. Exit Doors: Where required by governing authorities having jurisdiction at the Site, provide panic exit devices, of the type required, including UL labels.
2. Fire Doors: Where shown or specified as a fire-resistance-rated door, provide units listed and labeled by UL, to comply with the fire-resistance-rating and size of door shown.
3. Strikes: Provide manufacturer's standard wrought stainless steel jamb-mounted top latch bolt and bottom latch bolt for each location and use shown to allow independent opening and closing of each leaf of double doors with panic exit devices; complying with UL List of Inspected Fire Protection Equipment and Materials and NFPA 80 requirements.
4. Lock Throws: Provide minimum of 3/4-inch latch bolt throw complying with UL List of Inspected Fire Protection Equipment and Materials and NFPA 80 requirements.
5. Provide concealed vertical rod type exit device and mortise type exit devices as specified.
6. Provide the following features and materials:
   a. Latch Bolt: Two-piece; mechanical; anti-friction, stainless steel.
   b. Dead Bolt: One-piece, stainless steel with two enclosed hardened-steel roller armor pins.
   c. Case: Wrought steel, zinc dichromatized.
   d. Cylinders: High-security; brass; pick- and drill-resistant; ANSI/BHMA A156.5 - E09211A.
   e. Armor Front: 8-inches by 1-1/4-inches wide, minimum; steel.
   f. Escutcheon: 8-inches by 2-1/2-inches wide by 3/16-inches thick, minimum; stainless steel, US 32D.
   g. Hubs: Sintered steel, copper infiltrated.
   h. Crossbar: Oval, seamless with interlocking expansion collets and roll pins; knurled, satin stainless steel, 0.062-inches minimum thickness, with steel reinforcing tube.
   i. Concealed bolts: Minimum 1/2-inch diameter, stainless steel.
7. Backset: Provide minimum backset of 2-3/4-inches.
8. Finish: US 32D satin.
9. ANSI/BHMA: A156.3, Type 3 and Type 8, Grade 1; F08, entrance by lever, key locks or unlocks lever for entrances shown as accessible to people with disabilities as required by ADAAG; and F05, entrance by thumb piece, key locks or unlocks thumb piece.
10. Electrically Controlled Devices: ANSI A156.3 & A156.24.

11. Electronic Exit Bars: Nonlatching electronic releasing device, activated by an adjustable capacitance sensor, with no moving parts; listed and labeled as panic exit hardware. Fabricate bar from extruded aluminum, and provide door and frame transfer device and 16 feet of cord to route wiring off the door frame.
12. Products and Manufacturers: Provide one of the following:
    a. 1530-L8 (F) and -T8 (F) Series Mortise Exit Devices and 1520(F) CVR Concealed Vertical Rod Exit Devices; with Escutcheon Trim and Augusta - ASL Lever Handles and Thumbpiece/Handle/Cylinder Unit by Yale Security, Incorporated, Division of Yale Security Group.
    b. Or equal.
13. Electrically Controlled Products and Manufacturers: Provide one of the following:
    a. 7130 F Series Mortise Exit Devices and 7160 F90 CVR Concealed Vertical Rod Exit Devices; with Escutcheon Trim and Augusta - ASL Lever Handles and Thumb piece/Handle/Cylinder Unit by Yale Commercial Locks and Hardware, an ASSA ABLOY Group company.
    b. ED66900 Series Electrically Controlled Mortise Exit Devices and ED 6800 Concealed Vertical Rod Exit Devices; with Escutcheon Trim and Newport – N4M Lever Handles and D Grip T7M Thumbpiece/Handle/Cylinder Unit by Corbin Russwin Architectural Hardware, an ASSA ABLOY Group company.
    c. Or equal.

E. Cylinders and Keying System:
1. Standard System: Except as otherwise specified, provide new master key system for the Project.
2. Multiple-Building System: Except as otherwise specified, provide new grandmaster key system for Project.
3. Existing System: Grandmaster key or great-grandmaster keys the locks to CITY's existing system, with a new master key for the Project.
4. Review the keying system with CITY's and provide the type required (master, grandmaster or great grandmaster), either new or integrated with CITY's existing system.
5. Furnish all locks with manufacturer's cylinders for interchangeable-core pin tumbler inserts. Furnish only temporary inserts for the construction period, and remove these before Substantial Completion. Construction control keys and cores shall not be part of CITY's permanent keying system. Permanent cores and keys shall be furnished to CITY prior to Substantial Completion.
6. Comply with the CITY's instructions for master keying and, except as otherwise specified, provide individual change key for each lock which is not designated to be keyed alike with a group of related locks.
7. Permanent keys and cores shall be stamped with the applicable key mark for identification. These visual key control marks or codes shall not include the actual key cuts. Permanent keys shall also be stamped "DO NOT DUPLICATE".
8. Cylinder Material: Brass, bronze or Series 300 stainless steels.

9. Cylinder Features: Seven-pin, high-security, removable core.
10. Key Material: Nickel silver.
11. Key Quantity: Furnish three keys for each lock and five keys for each master and grandmaster system. Provide one extra key blank for each lock.
12. Provide a key control system including envelopes, labels, tags with self-locking key clips, receipt forms, three-way visible card index, temporary markers, permanent markers and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150 percent of the number of locks required for the Project. Provide a hinged-panel type cabinet, for wall mounting.

F. Overhead, Surface-Mounted, Door Closers:
1. Provide all doors, unless specially shown or specified as being provided with floor-mounted or concealed overhead closers, with surface-mounted overhead door closers. Provide both active and inactive door leafs with closers.
2. Size of Units: Except as otherwise specified, comply with the manufacturer's recommendations for size of door control unit, depending upon size of door, exposure to weather, and anticipated frequency of use.
3. Where parallel arms are specified, and for closers on exterior doors, provide closer unit one size larger than recommended for use with standard arms.
4. Use parallel arm arrangement for doors that would otherwise have the door closer appearing in finished corridors or entries.
5. Comply with UL, Building Materials Directory, and List of Inspected Fire Protection Equipment and Materials, and NFPA 80. Modify closers specified as required.
6. Provide hold open feature for all non-fire-resistant-rated doors, unless otherwise specified.
7. Provide corner bracket mounting on exterior doors. Select all arms to clear weather-stripping, and overhead door holders.
8. Provide long arm to allow door to swing 180 degrees where long arm will eliminate floor-mounted stops.
9. Provide closers with spring power adjustment feature capable of increasing spring power 15 percent minimum in all closer sizes.
10. Provide individual regulating valves for closing and latching speeds, and separate adjustable back check valve.
11. Provide delayed closing action feature on all door closers. Position valve at top of closure.
12. Provide the following materials and features:
    a. Full Metal Cover: Aluminum.
    b. Case: Cast-iron.
    c. Arms: Plated to match full metal covers.
    d. Other Parts: Steel.
    e. Extreme temperature fluid.
    f. Security torx machine screws.
    g. Ten-year warranty.
    h. Provide manufacturer's optional corrosion protection.
13. Finishes: US 26D satin chrome. Color coordinate all arms and other accessories.

14. Highly Corrosive Atmospheres: Provide all closers with specified manufacturer's optional corrosion protection.
15. ANSI/BHMA: A156.4, C02011, in compliance with PT 1 and PT 4.
16. Products and Manufacturers: Provide one of the following:
    a. DC2000DA M71, M73, M74, M75, M87 by Corbin Russwin, Incorporated, Division of Yale Security Group.
    b. Or equal.

G. Heavy-Duty, Concealed Overhead Holders and Stops:
1. Provide heavy-duty, concealed overhead holders and stops on all exterior and all interior doors, unless otherwise specified to receive an extra heavy-duty overhead holder and stop in List of Finish Hardware Items at end of Part 3. Comply with UL and NFPA requirements for hold-open feature.
2. Provide the following features and materials:
    a. Shock Absorber Spring: Heavy tempered steel.
    b. Channel: Heavy-gauge brass.
    c. All other Parts: Stainless steel.
    d. Adjustment: Degree of hold-open and stop shall be adjustable after installation.
3. Finish: US 32D satin.
4. Coordinate placement of concealed overhead holder and stop with overhead closers.
5. ANSI/BHMA: A156.8, C51511.
6. Products and Manufacturers: Provide one of the following:
    a. Heavy-Duty 100H (ADJ) Series Concealed Holders and Stops by Glynn-Johnson Part of Worldwide Ingersoll-Rand Corporation.
    b. Or equal.

H. Flush Bolts and Automatic Flush Bolts:
1. Provide flush bolts on the inactive leaf of all pairs of doors, unless otherwise specified.
2. Provide flush bolts at the top and bottom of door.
3. Provide downset of 12-inches for all automatic flush bolts, and manufacturers' automatic flush bolt strikes, for the locations specified in List of Finish Hardware Items at end of Part 3.
4. Comply with UL, Hardware, Automatic or Surface Bolts, and NFPA 80, for automatic flush bolt requirements.
5. Provide the following features and materials:
    a. Automatic Flush Bolts: All parts bronze.
    b. Flush Bolt Levers: Forged Brass.
    c. Flush Bolt Plate: Forge Brass.
    d. Flush Bolt Guide and Strike: Wrought Brass.
    e. Flush Bolt Rods: 1/2-inch round rods, bronze, 12-inches minimum length.
    f. Bolt Head: Brass.
6. Provide extension flush bolts with 3/4-inch throws and with top bolt not over 6 foot-0 inches above finished floor. Provide bottom flush bolt 12-inches long.

7. ANSI/BHMA: A156.16: L14081, L14251 and L14091.
8. Products and Manufacturers: Provide one of the following:
   a. GJ FB6 Extension Flush Bolts by Glynn-Johnson Part of Worldwide Ingersoll-Rand.
   b. Or equal.
9. Where required by governing authorities having jurisdiction at the Site, provide cast bronze automatic flush bolts bearing the UL label.
10. Products and Manufacturers: Provide one of the following:
    a. GJ FB30 Automatic Flush Bolts by Glynn-Johnson Part of Worldwide Ingersoll-Rand Corporation.
    b. Or equal.

I. Coordinators:
1. Provide coordinator device on all pairs of doors required or specified to have automatic flush bolts, or panic exit devices. Comply with UL, List of Inspected Fire Protection Equipment and Material, and NFPA 80 requirements.
2. Provide manufacturer's standard units equipped with a safety release mechanism which allows the active leaf to close if under extreme pressure and whose active door lever, located nearest the active doorstop, holds the active door ajar until the trigger mechanism is released to the retracted position by the closing of the inactive leaf.
3. Materials: Anodized aluminum.
4. Finish: US 27 satin.
5. ANSI/BHMA: A156.3, BHMA 5.1, Type 21A.
6. Products and Manufacturers: Provide one of the following:
   a. COR 1, 2 and 3 Series with FB Series by Glynn-Johnson Part of Worldwide Ingersoll-Rand.
   b. Or equal.

J. Astragals:
1. Provide metal astragal bar, not less than 1/8 inch by 2 inches, for exposed flathead screw mounting on active leaf of all pairs of doors. Comply with UL and NFPA requirements for types and locations of astragals.
2. Provide astragal of cold-rolled steel with prime painted finish.
3. Provide astragal of extruded aluminum with clear anodized finish.
4. Products and Manufacturers: Provide one of the following:
   a. No. 357 Series by Pemko Manufacturing Company.
   b. Or equal.

K. Dust-Proof Strikes:
1. Provide brass dust-proof strikes, which incorporate a slotted plunger raised to flush position by spring tension for all flush bolts.
2. Provide 5/8-inch inside diameter dust-proof strikes; threshold mounted and surface mounted.
3. Finish: US 26D satin chrome.
4. ANSI/BHMA: A156.16, L14011-L14012.

5. Products and Manufacturers: Provide one of the following:
    a. DP-1 and DP-2 by Glynn-Johnson Part of Worldwide Ingersoll-Rand.
    b. Or equal.

L. Door Pulls, Push and Protection Armor:
1. Door Pulls: Provide heavy-duty surface-mounted door pulls with pull plates where specified in List of Finish Hardware Items at end of Part 3.
    a. Door pulls shall be stainless steel US 32D and have 1-inch diameter 12-inch long handles which project 2-1/2 inches from pull plate surface.
    b. Pull plates shall be 8 inches by 16 inches, stainless steel US 32D; 0.050-inches thick.
    c. Provide all non-removable fasteners.
    d. Pulls shall be fastened to plates at factory.
    e. ANSI/BHMA: A156.6, J405; B3E.
    f. Products and Manufacturers: Provide one of the following:
        1) 40 Series Pull Plates and Handles by Hager Hinger Company.
        2) Or equal.
2. Push Plates:
    a. Provide 0.125-inch thick stainless steel plate with No. 4 finish.
    b. Size: 8 inches by 16 inches with beveled edges.
    c. ANSI/BHMA: A156.6, J304; B3E.
    d. Products and Manufacturers: Provide one of the following:
        1) 80S Beveled by Hager Hinger Company.
        2) Or equal.
3. Protection Armor:
    a. Provide one armor plate per leaf of each door scheduled to receive armor-plate protection.
    b. Provide 16-gauge stainless steel with No. 4 finish 2 foot-0 inches high by 2 inches less in width than width of door.
    c. ANSI/BHMA: A156.6, J101; B3E.
    d. Products and Manufacturers: Provide one of the following:
        1) 193S Beveled Stainless Steel Armor Plate by Hager Hinge Company.
        2) Or equal.

M. Stripping and Seals:
1. Provide perimeter weather stripping at all exterior doors. Provide stripping and seals for interior doors where scheduled in List of Finish Hardware Items at end of Part 3.
2. Continuity of Stripping: Except as otherwise specified, stripping at each opening shall be continuous and without unnecessary interruptions at door corners and hardware.
3. Replaceable Seal Strips: Resilient or flexible seal strip of every unit shall be easily replaceable and readily available from stocks maintained by the manufacturer.

4. Provide bumper-type weather-stripping at jambs and head, including a resilient insert and metal retainer strip, surface-applied, of the following metal, finish and resilient bumper material:
    a. Housing: Extruded aluminum with dark bronze anodized finish; 0.062-inch minimum thickness of main walls and flanges.
    b. Dimensions: 1-3/8 inches by 7/8 inches, stop-mounted.
    c. Seals: Closed-cell extruded silicone.
    d. ANSI/BHMA: A156.22, R3E264.
    e. Products and Manufacturers: Provide one of the following:
        1) No. 350DSPK and 2891 DPK (for parallel arms) by Pemko Manufacturing Company.
        2) Or equal.
5. Provide heavy-duty automatic drop-seal sound-stripping door-bottom unit of manufacturer's standard design, with operating seal bar of the following material, retained in an extruded metal bar and capable of operating to close a 3/4-inch gap (from door bottom to floor or threshold). House mechanism and operating bar in the following metal housing, for mounting in doors as follows:
    a. Housing: Extruded aluminum, 0.062-inch thick, with mill aluminum finish.
    b. Seal: Closed-cell extruded silicone.
    c. Mounting: Full-mortise.
    d. ANSI/BHMA: A156.22, R3E344.
    e. Products and Manufacturers: Provide one of the following:
        1) No. 434APKL by Pemko Manufacturing Company.
        2) Or equal.

N. Thresholds:
1. All exterior and interior doors shall be provided with thresholds.
2. Metal: Mill finish extruded bronze.
3. Surface Pattern: Fluted tread, manufacturer's standard.
4. Provide countersunk stainless steel screws and expansion shields.
5. Width: Five-inches wide and of length sufficient to span full width of rough openings, coped and scribed neatly at and around doorframes.
6. Construction:
    a. Single-piece, complying with manufacturer's recommendations.
7. Profile: Provide manufacturer's unit, which conforms to the minimum size and profile requirements specified.
    a. Floor Drop: Except where no change in floor elevation is shown from one side of threshold to the other, provide profile that accommodates 1/2-inch drop in floor elevation, unless another dimension is shown.
    b. For doors equipped with panic hardware, including floor bolts, provide profile with stop bar of proper size and shape to function as the strike plate for the floor bolts.
8. Thickness: 1/2 inch, minimum.
9. ANSI/BHMA: A156.21, J12100.
10. Products and Manufacturers: Provide one of the following:

a. 171B by Pemko Manufacturing Company.
b. Or equal.

O. Silencers:
1. Provide silencers for all doorframes.
2. Provide pneumatic design that, once installed, forms an air pocket to reduce noise.
3. Provide minimum of three per strike side of doorjambs.
4. ANSI/BHMA: A156.16, BHMA 6.5, L03011.
5. Products and Manufacturers: Provide one of the following:
a. GJ 64 by Glynn-Johnson Part of Worldwide Ingersoll-Rand.
b. Or equal.

P. Wall and Floor Stops: Provide the following where scheduled in List of Finish Hardware Items at end of Part 3:
1. Dome-Type Floor Stops:
a. Cast bronze extra heavy-duty wall mounted doorstop, one per leaf.
b. Coordinate height of dome-type floor mounted doors stops with threshold condition and undercut of door.
c. Finish: US 26D satin chrome.
d. ANSI/BHMA: A156.16, L12161.
e. Products and Manufacturers: Provide one of the following:
1) FB13/14R, FB17 by Glynn-Johnson Part of Worldwide Ingersoll-Rand Corporation.
2) Or equal.
2. Wall Stops:
a. Cast bronze extra heavy-duty wall mounted doorstop, one per leaf.
b. Convex rubber bumper.
c. ANSI/BHMA: A156.16, L12101.
d. Products and Manufacturers: Provide one of the following:
1) GJ 50C by Glynn-Johnson Part of Worldwide Ingersoll-Rand Corporation.
2) Or equal.

Q. Sealants: Provide elastomeric sealant complying with FS TT-S-00227, Type 2 (non-sag) Class A for use with thresholds.

2.3 HARDWARE FINISHES

A. Provide matching finishes for finish hardware units at each door or opening, to the greatest extent possible in compliance with ANSI/BHMA A156.18.

B. Reduce differences in color and textures as much as commercially possible where the base metal or metal forming process is different for individual units of finish hardware exposed at the same door or opening. In general, match all items to the manufacturer's standard finish for the latch and lock set for color and texture.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the substrate to receive finish hardware, and the conditions under which the Work will be performed, and notify ENGINEER, in writing, of unsatisfactory conditions. Do not proceed with the finish hardware Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

3.2 PREPARATION

A. Templates: Furnish finish hardware templates to each fabricator of doors, frames and other Work to be factory-prepared for the installation of finish hardware. Check the Shop Drawings of such other Work, to confirm that adequate provisions are made for the proper installation of the finish hardware.

B. Prepare Work to receive finish hardware Work in compliance with ANSI/DHI A115.1.

3.3 INSTALLATION

A. Installer shall check and approve the installation before operation. Installer shall assure that the system operates to the DEPARTMENT's and CITY's satisfaction.

B. Mount finish hardware units at heights recommended in, Door and Hardware Institute, "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames" and "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames", except as otherwise specified or required to comply with governing authorities having jurisdiction at the Site, HMMA 830 and ADAAG requirements.

C. Install each finish hardware item in compliance with the manufacturer's instructions and recommendations and approved Shop Drawings. Wherever cutting and fitting is required to install finish hardware onto or into surfaces that are later to be painted or finished in another way, install each item completely, then remove, and store in a secure place during the finish application. After completion of the finishes, re-install each item. Do not install surface-mounted items until finishes have been completed on the substrate.

D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

F. Cut and fit threshold and floor covers to profile of doorframes, with mitered corners and hair-line joints. Join units with concealed welds or concealed mechanical joints. Cut smooth openings for spindles, bolts and similar items, if any.

G. Screw thresholds to substrate with No. 10 or larger screws, of the proper type for permanent anchorage and of bronze or stainless steel that will not corrode in contact with the threshold metal.

H. Set thresholds in a bead of elastomeric sealant to completely fill concealed voids and exclude moisture from every source. Do not plug drainage holes or block weeps. Remove excess sealant before sealant cures to a firm set.

I. Adjust and check each operating item of finish hardware and each door, to ensure proper operation or function of every unit. Lubricate moving parts with the type lubrication recommended by manufacturer (graphite-type if no other recommended). Replace units that cannot be adjusted and lubricated to operate freely and smoothly as intended for the application.

J. Final Adjustment: Where finish hardware installation is made more than one month prior to Substantial Completion, return to the Work during the week prior to acceptance or occupancy, and make a final check and adjustment of all finish hardware items in each space and area. Clean and re-lubricate operating items as necessary to restore proper function and finish of finish hardware and doors. Adjust door control devices to compensate for final operating of heating and ventilating equipment.

K. Provide manufacturer’s authorized representative to instruct and train CITY's personnel in proper adjustment and maintenance of finish hardware during the final adjustment of finish hardware.

L. Finish hardware, which is blemished or defective, will be rejected even though it was set in place before defects were discovered. Remove and replace with new finish hardware. Repair all resultant damage to other Work.

M. Continued Maintenance Service: Approximately six months after the acceptance of finish hardware in each area, the installer, accompanied by the representative of the latch and lock manufacturer, shall return to the Project and re-adjust every item of hardware to restore proper function of doors and finish hardware. Consult with and instruct CITY's personnel in recommended additions to the maintenance procedures. Clean and lubricate operational items wherever required. Replace finish hardware items that have deteriorated or failed due to faulty design, materials or installation of finish hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance or the finish hardware.

3.4 FIELD QUALITY CONTROL

A. Provide a written field report, prepared by installer's architectural hardware consultant, identifying actual condition, location, manufacturer, and product designation for each item of finish hardware actually present on each door at the Site, including whether finish hardware is adjusted and operating properly, compared with each item referenced to approved Shop Drawings and Contract requirements.

B. Installer's hardware consultant shall provide opinions to, and assist ENGINEER in determining, acceptability of installation as Work proceeds. All comments and discussions, conversations and meetings with ENGINEER shall be included in written field report for submission to ENGINEER for review and approval at completion of finish hardware installation.

C. As part of written field report to be submitted to ENGINEER for approval, recommend remedial actions for Work not in compliance with these Specifications. No payment for Work shall be made until remedial recommendations and actions have been approved by ENGINEER and incorporated into the Work.

3.5 LIST OF FINISH HARDWARE ITEMS

A. Scheduled items for each door are generic and rely on information specified above. The listing of hardware functions and types provided are only a general guideline for the final Finish Hardware Schedule. CONTRACTOR shall submit a Finish Hardware Schedule acceptable to all governing authorities having jurisdiction at the Site.

B. Hardware Schedule: Provide the following finish hardware items:
   a. Door No. 101-01 – Single Doors.
      1) Mortise Hinges.
      2) Panic Exit Device.
      3) Overhead, Surface-Mounted Door Closer.
      4) Heavy-Duty, Concealed Overhead Holder and Stop.
      5) Stripping and Seals.
      6) Threshold.
   b. Door No. 201-01, 202-01 and 202-02 – Double Doors.
      1) Mortise Hinges.
      2) Panic Exit Device.
      3) Overhead, Surface-Mounted Door Closers (both door leafs).
      4) Heavy-Duty, Concealed Overhead Holders and Stops.
      5) Manual Flush Bolts (on inactive leafs).
      6) Astragal
      7) Dust-Proof Strikes.
      8) Stripping and Seals.
      9) Threshold.

+ + END OF SECTION + +

SECTION 08 81 00

GLASS GLAZING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, tools, equipment and incidentals as shown, specified and required to furnish and install glass and glazing.
   2. Extent of glass and glazing is shown.
   3. Types of products required include the following.
      a. Clear, fully tempered, float glass.
      b. Clear, laminated, fully tempered fire-safety glass.
      c. Low-E, tinted, fully tempered, insulating, float glass.
      d. Structural and non-structural glazing sealants.
      e. Miscellaneous glazing, spacers, tapes and other materials.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before, the glass and glazing Work.
   2. Notify other contractors in advance of the installation of the glass glazing to provide them with sufficient time for the installation of items included in their contracts that must be installed with, or before, the glass glazing Work.

C. Related Sections:
   1. Section 08 11 13, Hollow Metal Doors and Frames.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. American Architectural Manufacturers Association, (AAMA).
      a. AAMA 800, Voluntary Specifications and Test Methods for Sealants.
   2. American National Standards Institute, (ANSI).
      a. ANSI Z97.1, Safety Glazing Materials Used in Buildings.
      b. ANSI/ASTM E 774, Specification for Classification of the Durability of Sealed Insulating Glass Units.
      c. ANSI/ASTM E 1300, Practice for Determining Load Resistance of Glass in Buildings.
   3. American Society of Civil ENGINEERS, (ASCE).
      a. ASCE 7, Minimum Design Loads for Buildings and Other Structures.
   4. American Society for Testing and Materials, (ASTM).

a. ASTM C 509, Specification for Elastomeric Cellular Performance Gasket and Sealing Material.
b. ASTM C 719, Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants under Cyclic Movement (Hockman Cycle).
c. ASTM C 793, Test Method for Effects of Laboratory Accelerated Weathering on Elastomeric Joint Sealants.
d. ASTM C 794, Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
e. ASTM C 864, Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
f. ASTM C 920, Specification for Elastomeric Joint Sealants.
g. ASTM C 1021, Practice for Laboratories Engaged in Testing of Building Sealants.
h. ASTM C 1036, Specification for Flat Glass.
i. ASTM C 1048, Specification for Heat-Treated Flat Glass-Kinds HS, Kind FT Coated and Uncoated Glass.
j. ASTM C 1087, Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.
k. ASTM C 1115, Specification for Dense Elastomeric Silicone Rubber Gaskets and Accessories.
l. ASTM C 1172, Specification for Laminated Architectural Flat Glass.
m. ASTM C 1249, Guide for Secondary Seal for Sealed Insulating Glass Units for Structural Sealant Glazed Applications.
n. ASTM C 1281, Specification for Preformed Tape Sealants for Glazing Applications.
o. ASTM C 1330, Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.
p. ASTM D 412, Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
q. ASTM D 624, Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
r. ASTM D 2240, Test Method for Rubber Property-Durometer Hardness.
s. ASTM E 548, Guide for General Criteria Use for Evaluating Laboratory Competence.

5. Code of Federal Regulations, (CRF).
   a. 16 CFR, Consumer Product Safety Commission, CPSC Part 1201, Safety Standard for Architectural Glazing Materials.
6. Glass Association of North America, (GANA).
   a. GANA, Glazing Manual.
   b. GANA, Laminated Glass Design Guide.
   c. GANA, Glass Tempering Division, GTA 95-1-31, Specification for Decorative Architectural Flat Glass.
7. Lawrence Berkeley National Laboratory National Technical Information Service, (LBL).
   a. LBL-35298 Window 4.1, “A PC Program for Analyzing the Thermal Performance of Fenestration Products.”

8. National Fire Protection Association, (NFPA).
    a. NFPA 80, Standard for Fire Doors and Fire Windows.
    b. NFPA 252, Standard Methods of Fire Tests of Door Assemblies.
    c. NFPA 257, Standard on Fire Tests for Window and Glass Block Assemblies.
9. National Fenestration Rating Council, (NFRC).
    a. NFRC 100, Procedure for Determining Fenestration Product U-Factors.
    b. NFRC 200, Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.
    c. NFRC 300, Procedures for Determining Solar Optical Properties of Simple Fenestration Products.
10. National Glass Association, (NGA).
    a. NGA, Glazier Certification Program.
11. Primary Glass Manufacturers Council, (PGMC).
    a. PGMC Specifiers' Guide to Architectural Glass.
12. Sealed Insulating Glass Manufacturers Association, (SIGMA).
    a. SIGMA TM-3000-90, Vertical Glazing Guidelines and TB-3001-90, Sloped Glazing Guidelines.
13. Underwriters' Laboratories, Inc., (UL).
    a. UL Building Materials Directory.

1.3 QUALITY ASSURANCE

A. Primary Glass Manufacturer and Glazing Materials Manufacturer Qualifications:
    1. Provide glass and glazing materials manufactured by firms specializing in the production of the types of glass and glazing products specified, in compliance with specified standards.
    2. Provide glass from manufacturers who are members of GANA and PGMC and participate in certification programs.
    3. Obtain glass and glazing materials from manufacturers who will send a qualified technical representative to the Site, for the purpose of advising the installer of proper procedures and precautions for the use of the materials and who will assist ENGINEER with opinions on the acceptability of materials and Work.

B. Fabricator Qualifications:
    1. Provide laminated and insulating glass fabrications from fabricators who are licensed by primary glass manufacturer to produce specified units and with documented skill and successful experience in this type of Work and who agree to employ only tradesmen who are trained, skilled and have successful experience in this type of Work.
    2. Provide laminated and insulating glass fabrications from fabricators who are members of GANA or SIGMA and participate in certification programs.
    3. Obtain laminated and insulating glass fabrications from fabricators who will, if required, send a qualified technical representative to the Site, for the purpose of assisting ENGINEER with opinions on the acceptability of materials and installation methods.

C. Installer's Qualifications:
   1. The installer of the glass and glazing materials shall be a firm with documented skill and successful experience in the installation of the types of materials required and who agrees to employee only tradesmen who are trained, skilled and have successful experience in the types of materials and glazing systems specified and who are certified under the National Glass Association Glazier Certification Program as Level 3 (Master Glaziers).
   2. Submit records of experience and certifications to ENGINEER.

D. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing specified, as documented according to ASTM E 548.

E. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct testing specified, as documented according to ASTM E 548.

F. Source Limitation: All materials provided under this Section shall be obtained from a single supplier or manufacturer who, with CONTRACTOR, shall assume full responsibility for the completeness of the Work. The supplier or manufacturer shall be the source of information on all material furnished regardless of the manufacturing source of that material.

G. Regulatory Requirements:
   1. Wherever a fire-resistance-rating classification is shown or scheduled for doors or windows, (1-hour, 2-hour, 3-hour), provide glass complying with the requirements specified and established by UL, NFPA and other governing authorities having jurisdiction at the Site.
   2. Safety Glass: Comply with ANSI Z97.1, with label on each piece of glass as required by governing authorities having jurisdiction.

H. Codes: Comply with applicable requirements of codes referenced in Section 01 42 00, References.

1.4 SUBMITTALS

A. Samples: Submit the following:
   1. 12-inch square samples of each type of glass required.
   2. Insulating glass samples need not be hermetically sealed, but edge construction, wavelength-selective interlayer and low-E coatings shall be included and identified. Include specially prepared samples with each interlayer film product's identity marked on film and incorporated into sample.
   3. Submit 12-inch long samples of each color for each type of exposed-to-view glazing sealant and gasket. Install sample between two strips of material similar to, or representative of, channel surfaces where sealant or gasket will be used, held apart to represent typical joint widths.

4. Review of samples by ENGINEER will be for color, texture and pattern only. Compliance with other requirements is the responsibility of CONTRACTOR.

B. Shop Drawings: Submit the following:
1. Copies of manufacturers' specifications, "Spec-Data" sheets, installation instructions for each type of glass, glazing sealant or compound, gasket and associated miscellaneous material and all recommended installation precautions for required materials and components, which are not included in other submittals, specified in other Sections. Coordinate the submittal of such other data with this submittal, and with the submittal of samples required by other Sections.
2. Structural performance calculations indicating that detailing and fabrication have been based on the results of the required analysis and performance criteria specified.
3. Plans and elevations showing location of each type and kind of glass specified and details of glazing system. Include manufacturer's recommendations for glazing.
4. Manufacturer’s and fabricator’s guarantees, as specified.
5. Fabricator's qualifications.
6. Installer's qualifications.
7. Age of silicone sealant.
8. Certification that fabricated products comply with manufacturer's published performance.
9 Dimensions and details of manufacturer's glue line thickness and bite dimensions and verifications.

C. Test Reports: Submit the following:
1. Certified laboratory test reports for required performance tests in compliance with ASTM E 548.
2. Structural silicone sealant performance features and calculations indicating sealant joints have been detailed and fabricated in compliance with silicone sealant manufacturer’s recommended guidelines for dissimilar metal adhesion. Structural and other performance calculations for the structural silicone joints shall be prepared, signed and stamped with the seal of a Registered Professional ENGINEER, licensed to practice in the State of Pennsylvania, and recognized as an expert in the required Work.
3. Adhesion and compatibility test report from glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

D. Certificates of Compliance: Submit the following:
1. Certification that all glass materials subject to the applicable standards of the CPSC are in compliance. The certification shall be issued in conformance with procedures stated in the standard.
2. Include primary glass manufacturer's and fabricator’s published data, and letters of certification, based on certified test laboratory reports, indicating that each

material complies with specified requirements and is acceptable for the applications shown.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:
   1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete in ample time to prevent delay of that Work.

B. Storage and Protection:
   1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
   2. Protect glass and glazing materials according to manufacturer's and fabricator's written instructions to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
   3. For insulating glass that will be exposed to substantial altitude changes, comply with insulating glass fabricator's written recommendations for venting and sealing to avoid hermetic seal ruptures.

C. Acceptance at Site:
   1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify ENGINEER, in writing, if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

1.6 SPECIAL WARRANTIES

A. General: The special warranties specified in this Article shall not deprive DEPARTMENT or CITY of other rights or remedies DEPARTMENT or CITY may otherwise have under the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by CONTRACTOR under the Contract Documents.

B. Special Warranties:
   1. Laminated Glass: Provide written warranty, signed by the fabricator and CONTRACTOR and running to benefit of DEPARTMENT and CITY, agreeing to replace, for a period of five-years from the date of Substantial Completion, glass units that show deterioration, as specified.
   2. Insulating Glass: Provide written warranty, signed by the fabricator and CONTRACTOR and running to the benefit of DEPARTMENT and CITY, agreeing to replace, for a period of ten-years from the date of Substantial Completion, glass that shows signs of deterioration, as specified.
   3. Structural Silicone: Provide structural silicone manufacturer's twenty-year limited adhesion warranty and non-staining warranty for silicone structural

adhesive, commencing from the date of Substantial Completion. Perform all testing required to achieve the warranties.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Design Criteria: For glass performance, manufacture, size, type, construction and thickness, comply with the following:
   1. Provide glass and glazing systems capable of withstanding normal thermal movements and wind and impact loads without failure, including loss or glass breakage attributable to defective manufacture, fabrication, or installation; failure of sealants (both structural and weather-resisting) to remain watertight, airtight and to maintain structural performance characteristics specified; deterioration of glazing materials; or other defects in construction.
   2. Normal Thermal Movement: Provide glass that allows for thermal movements resulting from a maximum temperature range of 120°F in ambient and 180°F surface temperature acting on glass framing members and glazing components. Base structural performance calculations on surface temperatures of materials caused by both solar heat gain and nighttime-sky loss.
   3. Comply with requirements of Consumer Product Safety Commission, Part 1201, Safety Standards for Architectural Glazing Materials, for all the Work.
   4. Structural Performance: Provide structural calculations for analysis of required glass thicknesses for glass lites shown, that are used to establish final fabricating and detailing requirements. Indicate compliance with the following minimum criteria for all glass shown:
      a. Project Wind Speed: 70 miles per hour based on ASCE 7 and the other governing authorities having jurisdiction at the Site.
      b. Importance Factor: Category 1; Iw = 1.15; Design Factor: 1.15.
      c. Exposure Category: Exposure C; Ce = 1.13.
      d. Wind Stagnation Pressure: qs = 12.6 psf.
      e. Long-Duration Loading: One month.
      f. Short-Duration Loading: Sixty seconds, based on three-second gust speed.
      g. Probability of Breakage for Vertical Glazing: Eight lites per 1,000 under wind action.
      h. Maximum Lateral Deflection: For glass supported on all four edges, provide thickness required to limit center deflection at design wind pressure to 1/50 times the short side length or 1-inch, whichever is less.
   5. Glass thicknesses shown are minimums. Confirm glass thicknesses by analyzing Project structural loadings and in-service conditions using glass manufacturer's recommended load tables and other structural performance criteria specified. Where manufacturer’s load tables indicate acceptability of lesser thickness material than required by performance criteria specified, provide specified thicknesses and features as a minimum. Where load tables indicate the need for greater thickness, or additional features, than specified, provide greater

thicknesses and features at no additional cost to DEPARTMENT. Comply with practice for determining minimum thickness and types of glass, to resist loadings required by governing authorities having jurisdiction at the Site, according to ANSI/ASTM E 1300.

6. Test sealant in accordance with sealant manufacturer's recommendations.
7. Glazing Sealant System Compatibility:
   a. Glazing sealants shall be compatible with the channel surfaces, joint fillers, insulating glass sealing system, laminated glass interlayer material and other materials in contact with the glazing channel in compliance with ASTM C 1087.
   b. Provide insulating glass secondary sealant system compatible with structural silicone glazing system and in compliance with ASTM C 1249.
   c. Provide only materials and manufacturer's recommended variation of the specified materials, which are known to be fully compatible with the actual installation conditions, as shown by manufacturer's published data or certification submitted to ENGINEER for approval.
8. Adhesion of Elastomeric Joint Sealants: Comply with ASTM C 793 and ASTM C 794.
9. Center-of-Glass U-Values: NFRC 100 methodology using LBL-35298 WINDOW 4.1 computer-aided software design, expressed as Btu/square foot by height by degree F.
10. Center-of-Glass Solar Heat Gain Coefficient: NFRC 200 methodology using LBL-35298 WINDOW 4.1 computer-aided software design.
11. Solar Optical Properties: NFRC 300.

B. Definitions:
   1. Interspace: The space between lites of an insulating glass unit that contains dehydrated air or a specified gas.
   2. Deterioration of Coated Glass: Defects that develop from normal use, that are attributed to the manufacturing process, and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.
   3. Deterioration of Laminated Glass: Defects that develop from normal use, that are attributed to the manufacturing process, and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass or structural performance or safety of units; blemishes exceeding those allowed by specified laminated glass standards; and cracking, crazing or color change of films concealed in the lamination.
   4. Deterioration of Insulating Glass: Failure of the hermetic seal under normal use that is attributed to the fabricating process or incompatibility of sealants or mishandling during installation, and not to causes other than glass breakage and practices for maintaining and cleaning glass contrary to manufacturer's written

instructions. Evidence of failure shall include the obstruction of vision by dust, moisture, or film on interior surfaces of insulating glass.

2.2 GLASS

A. Clear, Fully Tempered, Float Glass: For all non-fire rated interior doors and windows.
   1. Uncoated, Monolithic, Clear, Fully tempered, Float Glass: Provide clear glass, with roll-wave distortion parallel to bottom edge of glass, in compliance with ASTM C 1048, Type I (transparent glass, flat), Class 1 (clear), Quality Q^3 (glazing select), Kind FT.
   2. Provide heat-treated glass that has been fully tempered by manufacturer's special process (after cutting to final size,) to achieve a flexural strength of two times that of annealed glass strength.
   3. For uncoated glass, comply with requirements for Condition A.
   4. Thickness: 1/4-inch thick, minimum.
   5. Visable Light Transmission: < 91 %.
   6. Products and Manufacturers: Provide one of the following:
      a. Clear, Fully Tempered, Float Glass by PPG Industries, Incorporated.
      b. Clear, Fully Tempered, Float Glass by Pilkington North America, Incorporated.
      c. Or equal.

B. Clear, Laminated, Fully Tempered Fire-Safety Glass with Intumescent Interlayers: For all fire rated interior doors and windows.
   1. Laminated glass made from multiple plies of uncoated, clear float glass; with intumescent interlayers; complying with testing requirements in NFPA 80 and 16 CFR 1201 for Category II materials; UL listed; ANSI Z97.1.
   2. Fire Rating: 45 minutes.
   3. Overall Unit Thickness: As required to achieve required fire rating.
   4. Clear laminated glass with multiple plies of fully tempered float glass.
      a. Thickness of Each Glass Ply: As required to achieve required fire rating.
      b. Intumescent Interlayer Thickness: 0.060 inch.
   5. Visible Light Transmittance: 58 percent minimum.
   6. Winter Nighttime U-Factor: .46 maximum.
   7. Summer Daytime U-Factor: .48.
   8. Solar Heat Gain Coefficient: .38 maximum.
   9. Provide safety glazing labeling.
   10. Products and Manufacturers: Provide one of the following:
      a. Pyrobel by InterEdge, Inc., a subsidiary of AFG Industries, Incorporated.
      b. PyroStop by Pilkington North America Incorporated.
      c. Or equal.

C. Low-E, Tinted, Fully Tempered, Insulating, Float Glass Units: For all exterior doors and windows.
   1. Insulating Glass Units: Provide preassembled units consisting of two lites of glass separated by a dehydrated interspace, and complying with ASTM E 2190

for Class C units, permanently and hermetically sealed together at edges with spacers and sealant.

2. System Sealing: Dual seal with polyisobutylene primary sealant and silicone secondary sealant, complying with ASTM C 1249.
3. Overall Unit Thickness: 1 inch.
4. Thickness of Each Glass Lite: 1/4 inch.
5. Outdoor Lite: Tinted, fully tempered, float glass, Kind FT.
6. Interspace Content: Argon.
7. Indoor Lite: Clear, Low-E, fully tempered, float glass; Kind FT.
8. Low-E Coating: Pyrolytic on third surface.
9. Visible Light Transmittance: 36 percent minimum.
10. Winter Nighttime U-Factor: .29.
11. Summer Daytime U-Factor: .28 maximum.
12. Solar Heat Gain Coefficient: 0.40, maximum.
13. Light to Solar Gain Ratio: 1.78
14. Shading Coefficient: 0.40.
15. Outdoor Visible Light Reflectance: 7 percent.
16. Provide safety glazing labeling.
17. Products and Manufacturers: Provide one of the following:
    a. Sungate 500, OptiGray, Fully Tempered, Insulating Glass by PPG Industries, Incorporated.
    b. Energy Advantage, Gray, Fully Tempered, Insulating Glass by Pilkington North America, Incorporated.
    c. Or equal.

2.3 GLAZING SEALANTS, TAPES AND GASKETS

A. General:
1. Colors: Provide black or other natural color wherever no other color is available. Wherever material is not exposed-to-view, provide manufacturer's standard color, which has the best overall performance characteristics for the application shown.
    a. Provide manufacturer's standard colors as shown or, if not shown, provide color selected by ENGINEER from manufacturer's standard colors to either blend or contrast with adjoining surfaces.
2. Hardness specified is intended to indicate the general range necessary for overall performance. Submit glazing and sealant manufacturer’s recommendations for actual hardness for each condition of installation and use. Except as shown or specified, provide glazing materials within the following ranges of hardness (Shore A, fully cured, at 75°F):
    a. 15 to 35 for elastomeric compounds and tapes used with rigid stops and frames for large glass sizes (in excess of 100 united inches). Provide material sufficiently hard to withstand exposure to abrasion and vandalism.
    b. 25 to 50 for rubber-like curing compounds used with rigid stops and frames for medium and small glass sizes (less than 100 united inches). Provide materials sufficiently hard to withstand impact of moving sash and doors.

c. 35 to 60 for molded gaskets used with rigid stops and frames, depending upon strength needed for application or insertion of units.
d. 75 to 80 for structural gaskets (not supported by stops).
e. Non-Elastomeric Compounds: (Shore A not applicable) 2 to 12 mm penetration for 5.0 seconds of penetrometer needle on nominally cured compound, complying with ASTM D 2451.

3. Provide size and shape of gaskets and preformed glazing units as recommended by the manufacturer and as indicated on approved Shop Drawings.
4. Comply with ASTM C 920 and other requirements for each liquid-applied, chemically curing sealant specified.
5. Where additional movement capability is specified, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement, in compliance with ASTM C 719, to withstand the specified percentage change in the joint width existing at the time of installation and remain in compliance with other requirements in ASTM C 920 for uses shown.

B. Preformed Butyl Rubber Back-Bedding Mastic Glazing Tape:
1. Preformed tape of polymerized butyl or mixture of butyl and polyisobutylene with inert fillers with built-in spacer of synthetic rubber, solvent-based with minimum 95 percent solids, non-sag consistency, tack-free time of 24 hours or less, paintable, non-staining, complying with AAMA 806.3.
2. Products and Manufacturers: Provide one of the following:
a. Polyshim II Glazing Tape by Tremco, Incorporated.
b. Or equal.

C. Dense Compression Wedge Gaskets:
1. Provide molded or extruded, closed-cell silicone wedge gaskets in compliance with ASTM C 1115, Type C.
2. Products and Manufacturers: Provide one of the following:
a. Dense Silicone Wedge Gaskets SCR-900 by Tremco, Incorporated.
b. Or equal.

D. Exterior, One-Part, Silicone Rubber Sealant:
1. Silicone rubber-based, one-part elastomeric sealant, complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT, M, G, A and O.
2. Products and Manufacturers: Provide one of the following:
a. Spectrem I by Tremco, Incorporated.
b. 863 Architectural Silicone Sealant by Pecora Corporation.
c. Or equal.

E. Structural Silicone Sealant:
1. Provide a one-component, self-priming, shelf-stable, neutral-cure, elastomeric adhesive complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT, G and A, and specifically formulated for silicone structural glazing complying with the following as-cured physical properties, after seven days at 77°F and 50 percent relative humidity:

2. Durometer Hardness, Shore A, points; ASTM D 2240: 27 to 40.
3. Ultimate Tensile, ASTM D 412: 225 to 350 psi.
4. Ultimate Elongation, ASTM D 412: 525 to 550 percent.
5. Tear Strength, Die B; ASTM D 624: 40 to 49 ppi.
6. Peel Strength, ASTM C 794: 30 to 40 ppi.
7. Products and Manufacturers: Provide one of the following:
   a. DOW CORNING 995 Silicone Structural Adhesive by Dow Corning Corporation.
   b. 895 Silicone by Pecora Corporation.
   c. Or equal.

2.4 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standards, requirements of manufacturers of glass and glazing materials for applications shown, and approved Shop Drawings. Provide materials with a proven record of compatibility with surfaces shown and specified.

B. Setting Blocks: Elastomeric material, 80 to 90 Shore A durometer hardness, with proven compatibility with sealants used in the Work and as recommended by the glass manufacturer.

C. Spacers and Edge Blocks: Elastomeric blocks or continuous extrusions, with a Shore A durometer hardness recommended by glass manufacturer to maintain lites in place and to limit lateral movement for installation shown, and with proven compatibility with sealants used in the Work.

D. Cylindrical Glazing Sealant Backing: Closed-cell or waterproof-jacketed rod stock of synthetic rubber or plastic foam complying with ASTM C 1330, Type O (open-cell material), proven to be compatible with sealants used, flexible and resilient, with 5 to 10 psi compression strength for 25 percent deflection.

E. Cleaners, Primers and Sealers: Type recommended by sealant, gasket and glass manufacturer.

2.5 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Glass manufacturer's recommended glazing channel dimensions are intended to provide for necessary minimum bite on the glass, minimum edge clearance and adequate sealant thicknesses, with reasonable tolerances. CONTRACTOR shall be responsible for correct glass size for each opening, within the tolerances and necessary dimensions established on approved Shop Drawings.

2.6 TOLERANCES

A. Allowable Tolerances: Provide fully tempered and heat-strengthened glass, formed by horizontal roller-hearth process, free of tong marks, and not exceeding the following flatness tolerances (either face, any direction, any location) based on 1/4-inch glass thickness with inversely proportionate tolerances for other thicknesses:
   1. For 12-inch Run: 1/16-inch bow.
   2. For 3-foot Run: 1/8-inch bow.
   3. For 7-foot Run: 1/4-inch bow.
   4. For 10-foot Run: 3/8-inch bow.

2.7 SOURCE QUALITY CONTROL

A. To the greatest extent possible, provide each type of glass and glazing materials from one manufacturer.

B. Providing insulating glass with a certified Class A rating according to SIGMA.

C. Obtain glass and sealant test results for product test reports from qualified testing agencies regularly engaged in the business of testing glass and sealant products.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the framing and glazing channel surfaces, backing, removable stop design, and the conditions under which the glass and glazing is to be performed, and notify ENGINEER, in writing, of any conditions detrimental to the proper and timely completion of the Work. Do not proceed with the glazing until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

3.2 PREPARATION

A. Clean the glazing channel, or other framing members to receive glass, immediately before glazing. Remove coatings, which are not firmly bonded to the substrate. Remove lacquer from metal surfaces wherever elastomeric sealants are used.

B. Apply primer or sealer to joint surfaces wherever recommended by sealant and glass manufacturer.

3.3 INSTALLATION

A. General:
   1. Comply with combined recommendations of glass, window and glazing products manufacturers and other materials used in glazing, except where more

stringent requirements are shown or specified, and as shown on approved Shop Drawings.

2. Comply with GANA, Glazing Manual, except as shown and specified otherwise, and except as specifically recommended otherwise by the manufacturers of the glass and glazing materials, as accepted by ENGINEER on approved Shop Drawings.
3. Inspect each piece of glass immediately before installation, and remove from Site all that have observable edge damage or face imperfections.
4. Unify appearance of each series of lights by setting each piece to match others as nearly as possible. Inspect each piece and set with pattern, draw and bow oriented in the same direction as other pieces.
5. Cut and install tinted and reflective glass as recommended in manufacturer's technical bulletin as provided on approved Shop Drawings.
6. Install sealants as recommended by sealant manufacturers, and as recommended on approved Shop Drawings.
7. Do not attempt to cut, seam, nip or abrade glass on Site, which is tempered, heat strengthened, or coated.
8. Do not proceed with installation of liquid glazing sealants under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitations for installation.
9. Proceed with glazing only when forecasted weather conditions are favorable to proper cure and development of high early bond strength. Wherever channel action is affected by ambient temperature variations, install glazing sealants only when temperatures are in the middle third of manufacturer's recommended installation temperature range, so that sealant will not be subjected to excessive elongation or compression, and bond stress will not be excessive at extremely low or high temperatures.
10. Coordinate the installation of the glass and glazing Work with the Progress Schedule in order to avoid delay of Project.

B. Tape and Sealant Glazing:
1. Place setting blocks in sill rabbets, sized and located to comply with referenced glazing publications. Set blocks in thin course of compatible sealant for heel bead. Position glass on setting blocks and press against tape for full contact.
2. Provide spacers for glass lites where the length plus width is larger than 4 foot-2 inches. 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.
3. Provide 1/8-inch minimum bite for spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
4. Provide edge spacers are shown on approved Shop Drawings and as required to prevent glass lites from moving sideways in glazing channel.

5. Cut glazing tape to length and set against permanent stops. Install horizontal strips first, extending over width of opening, before applying vertical strips.
6. Remove paper backing from tape. Place glazing tape on free perimeter of glass. Install tapes continuously. Do not stretch tape to make them fit openings. Place joints in tapes at corners of openings with adjoining lengths butted together, not lapped. Seal butt joints of tape with joint sealant.
7. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
8. Install removable stop, avoiding displacement of tape, and exert pressure on tape for full continuous contact. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops. Calk space above glazing tape to top of glazing stop. Tool exposed surfaces of sealant compounds to provide a substantial "wash" away from the glass.
9. Clean and trim excess glazing materials from the installation, and eliminate stains and discolorations.
10. Where wedge-shaped gaskets are driven into one side of the channel to pressurize the sealant or gasket on the opposite side, provide adequate anchorage to ensure that gasket will not "walk" out when subjected to dynamic movement. Anchor gasket to stop with matching ribs, or by proven adhesives, including embedment of gasket tail in cured heel bead. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
11. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended on approved Shop Drawings and to prevent corners from pulling away; seal corner joints and butt joints with sealant as recommended by gasket manufacturer and as shown on approved Shop Drawings.

C. Dry Gasket Glazing: Install glass in gaskets as recommended by the glass and window manufacturer. Refer to Section 08 11 13, Hollow Metal Doors and Frames, and 08 51 13, Aluminum Windows.

D. Structural Sealant Glazing: Install glass using a system of structural silicone sealants as recommended by the glass and sealant manufacturers

E. Cure glazing sealants and compounds in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability.

F. The installer shall advise CONTRACTOR of procedures required for the protection of glass and glazing sealants and compounds during the construction period, so that they will be without deterioration or damage, other than normal weathering, at the time of Substantial Completion.

G. Furnish specific instructions on the precautions and provisions required to prevent glass damage resulting from the alkaline wash from concrete surfaces and similar sources of possible damage.

H. Protect exterior glass from breakage immediately upon installation, by attachment of crossed streamers to framing held away from glass. Do not apply markers of any type to surfaces of glass.

I. Remove and replace glass, which is broken, chipped, cracked, abraded or damaged in other ways during the construction period, including natural causes, accidents and vandalism.

J. Maintain glass in a reasonably clean condition during construction, so that it will not be damaged by corrosive action and will not contribute (by wash-off) to the deterioration of glazing materials and other work.

K. Remove non-permanent labels and wash and polish glass on both faces not more than four days prior to Substantial Completion. Comply with glass manufacturer's recommendations for cleaning.

3.4 FIELD QUALITY CONTROL

A. Watertight and airtight installation of each piece of glass is required, except as otherwise shown. Each installation must withstand normal temperature changes, wind loading, impact loading (for operating sash and doors) without failure of any kind including loss or breakage of glass, failure of sealants or gaskets to remain watertight and air-tight, deterioration of glazing materials and other defects in the Work.

B. After nominal cure of exterior glazing sealants, which are exposed to the weather, test for water leaks. Flood the joint exposure with water directed from a 3/4-inch hose held perpendicular to wall face, 2 foot-0 inches from joint, connected to a water system with 30 psi minimum normal water pressure. Move stream of water along joint at an approximate rate of 20 foot-0 inches per minute.

C. Test approximately five percent of total glazing system, in locations which are typical of every joint condition, and which can be inspected easily for leakage on opposite face. Conduct tests in the presence of ENGINEER, who will determine the actual percentage of joints to be tested and the actual period of exposure to water from the hose, based upon the extent of observed leakage, or lack thereof.

D. Repair glazing installation at leaks or, if leakage is excessive, replace glazing sealants as directed by ENGINEER.

E. Wherever nature of observed leakage indicates the possibility of inadequate glazing joint bond strength, ENGINEER may direct that additional testing be performed at a

time when joints have been fully cured, followed by natural exposure through both extreme temperatures, and returned to the range of temperature in which it is feasible to conduct testing. Repair or replace Work as required and directed by the ENGINEER.

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SECTION 08 95 01

TRANSLUCENT WALL PANEL SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install translucent wall panel window system.
   2. The extent of the insulated translucent wall panel system is shown and specified.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate the installation of items that must be installed prior to the insulated translucent wall panel system Work.
   2. Notify other contractors in advance of the installation of the translucent wall panel system to provide them with sufficient time for the installation of items included in their Contracts that must be installed with, or before, the translucent wall panel system.

C. Related Sections:
   1. Section 07 92 00, Joint Sealants.
   2. Section 13 34 19, Metal Building Systems.

1.2 QUALITY ASSURANCE

A. Manufacturer's and Erector's Qualifications
   1. Sandwich panel system manufacturer must be listed by a recognized building code authority which requires quality control inspections by an approved agency.
   2. Quality control inspections and testing, conducted at least once each year shall include manufacturing facilities, sandwich panel components and production sandwich panels for conformance with AC177 as issued by the ICC-ES "Acceptance Criteria for Sandwich Panels" as regulated by the State and Local Building Codes or equivalent.
   3. Materials and products shall be manufactured by a company continuously and regularly employed in the manufacture of similar materials for a period of at least ten consecutive years; and which can show evidence of these materials being satisfactorily used on at least six projects of similar size, scope and type

within such a period. At least three of the projects shall have been in successful use for five years or longer.

4. Erection shall be by installer which has been in the business of erecting similar materials for at least five consecutive years; and can show evidence of satisfactory completion of projects of similar size, scope and type.

B. Performance Requirements: The manufacturer shall be responsible for the configuration and fabrication of the complete panel system.
   1. Panels shall resist a wind load of 35 pounds per square foot.
   2. Comply with the applicable requirements of the state and local building codes.

1.3 SUBMITTALS

A. Samples: Submit for approval the following:
   1. Samples of each required type and color of aluminum finish, on 12-inch long sections of extrusion shapes used in the Work, and 6-inch squares of sheet aluminum as required for the translucent wall panel units and accessories. Samples will be reviewed by ENGINEER for color and texture only. Compliance with other requirements is the exclusive responsibility of CONTRACTOR.
   2. ENGINEER reserves the right to require samples showing fabrication techniques and workmanship of component parts, and the design of accessories and other exposed auxiliary items for translucent wall panel system Work, before fabrication of the Work proceeds.
   3. One of each type fastener employed, with statement of intended use. Samples will be reviewed by ENGINEER for material and color only. Compliance with other requirements is the exclusive responsibility of CONTRACTOR.

B. Shop Drawings: Submit for approval the following:
   1. Shop Drawings for the assembly and erection of the entire insulated translucent wall panel system, showing all dimensions, gages, finishes, location of joints, connections, fasteners, expansion provisions, and locations and types of glazing gaskets, pressure plates and snap covers and other related items as required. Provide wall elevations at 1/4-inch scale, and full size detail sections of every typical composite member. Coordinate the submittal of Shop Drawings for component parts (as specified in other Sections) with this submittal. Show anchorages and alignments not shown on Shop Drawings of the components. Indicate clearly on Shop Drawings, all deviations from Contract Documents. Include structural calculations required to show compliance with wind pressure loading requirements in the Work.
   2. Copies of manufacturers' Specifications and installation instructions for required materials and components which are not included in the other submittals specified in other Sections of these Specifications. Coordinate the submittal of such other data with this submittal, and with the submittal of samples required by other Sections.

3. Maintenance Manual: Upon completion of the Work, furnish copies of detailed maintenance manual including the following information:
   a. Product name and number.
   b. Name, address and telephone number of manufacturer and local distributor.
   c. Detailed procedures for routine maintenance and cleaning.
   d. Detailed procedures for light repairs such as dents, scratches and staining.

C. Test reports to be furnished by sandwich panel system manufacturer. The manufacturer shall submit certified test reports made by an independent testing organization for each type and class of panel system. Reports shall verify that the material will meet all performance requirements of this specification. Previously completed test reports will be acceptable if current and indicative of products used on this project. Test reports required are:
   1. Flame Spread and Smoke Development (ASTM E-84).
   2. Burn Extent (ASTM D-635).
   3. Color Difference (ASTM D-2244).
   4. Impact Strength (UL 972).
   5. Bond Strength (ASTM C-297 and ASTM D-1002).
   6. Accelerated Aging (ASTM D-1037).
   7. Insulation "U" Factor (ASTM C-236).

D. Proof of regular, independent quality control monitoring under a building code review and listing program shall be submitted.

E. CONTRACTOR shall submit written guarantee accompanied by test reports that state that the products to be furnished are in accordance with or exceed this specification.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Storage of Materials:
   1. Store translucent panels on the long edge, several inches above the ground, blocked and under cover to prevent warping.
   2. Protect from weather and damage.
   3. Store in designated areas as close as possible to point of installation.

1.5 GUARANTEE

A. Insulated Sandwich Panels: Submit copies of written guarantee agreeing to repair or replace panels which fail to perform as specified, including failure of the seal due to faulty manufacture of the unit for a period of 5 years.

PART 2 – PRODUCTS

2.1 PRODUCT AND MANUFACTURER

A. Provide one of the following:
   1. Insulated Translucent Wall Panel System by Kalwall Corporation.
   2. Insulated Translucent Wall Panel System by Structures Unlimited, Incorporated.
   3. Or equal.

2.2 MATERIALS

A. Translucent Facing:
   1. Translucent faces shall be manufactured from glass fiber reinforced thermoset resins by insulated translucent wall panel system fabricator especially for architectural use.
   2. Flammability: The interior face sheet shall have a flamespread rating no greater than 50 and smoke developed no greater than 250 when tested in accordance with ASTM E-84. Burn extent by ASTM D-635 shall be no greater than 1 inch. Faces shall not deform, deflect or drip when subjected to fire or flame.
   3. Weatherability:
      a. The full thickness of the exterior face shall not change color more than 3.0 Hunter or CIE Units (DELTA E by ATM D-2244) after three years outdoor South Florida weathering at 7 degrees facing south, determined by the average of at least three white samples without a protective film or coating to insure maximum, long-term color stability.
      b. A white face sheet shall not darken more than .2 units (DELTA L by ASTM D-2244) when exposed to 150EF for two weeks.
      c. The exterior face shall have a permanent glass erosion barrier to provide maximum long-term resistance to reinforcing fiber exposure and shall be warranted against same for 25 years.
      d. The exterior face shall have a self-cleaning thermoset acrylic urethane surface molecularly bonded under factory controlled conditions, minimum 1.2 mils thick, and fully field restorable if worn or damaged.
   4. Appearance:
      a. The face sheets shall be uniform in color to prevent splotchy appearance. Faces shall be completely free of ridges and wrinkles which prevent proper surface contact in bonding to the aluminum grid core. Clusters of air bubbles/pinholes which collect moisture and dirt will not be acceptable.
      b. Exterior face sheets shall be .070 inches thick. Interior face sheets shall be .045 inches thick. Faces shall not vary more than 10 percent in thickness.
   5. Strength: The exterior face sheet shall be uniform in strength and repel an impact equal to 70 ft/lbs without fracture or tear in accordance with UL 792.
   6. Translucent Facing Color: Colors are to be selected by ENGINEER.

B. Non-Combustible Grid Core:

1. The thermally broken aluminum I-beams shall be 6063-T6 with provisions for mechanical interlocking of muntin-mullion and perimeter to prevent high and low intersections which do not allow full bonding surface to contact with face material. Width of I-beam shall be no less than 7/16 inch. Thermally broken aluminum I-beam for the grid shall be machined to tolerances of not greater than 0.002 inches. I beam thermal break, minimum 1-inch fiberglass composite. Poured and debridged is not acceptable.

C. Adhesive:

1. The laminate adhesive shall be heat and pressure resin type engineered for structural sandwich panel use. Adhesive shall pass testing requirements specified by the International Conference of Building Officials "Acceptance criteria for Sandwich Panel Adhesive".
   a. Initial bond strength between the face and the grid core shall be at least:
      1) 750 PSI tensile strength by ASTM C-297 after two exposures to six cycles each of the aging conditions prescribed by ASTM D-1037.
      2) 500 PSI shear strength average of five exposures by ASTM D-1002:
         a) 50 percent relative humidity at 73EF.
         b) Accelerated aging by ASTM D-1183.
         c) 182EF.
         d) Full Cycle Soak.
         e) 500 hour oxygen bomb.

2.3 PANEL CONSTRUCTION

A. Panels shall have a thickness of 2-3/4 inch with a "U" factor of .23, light transmission of 20 percent, and shading coefficient of 0.33.

B. Panels shall be fully removable and self-contained as a unit.

C. Translucent panels shall be a true sandwich panel of flat fiberglass sheets bonded to a grid core of mechanically interlocking thermally broken aluminum I-beams and shall be laminated under a controlled process of heat and pressure. Tape bond systems are not allowed.

D. Grid pattern shall be 12” x 24” Shoji.

E. The adhesive bonding line shall be straight, cover the entire width of the I-beam and have a neat, sharp edge. In order to insure bonding strength, white spots at intersections of muntins and mullions shall not exceed four for each 40 square feet of panel, nor shall they be more than 3/64 inches in width.

2.4 BATTENS AND PERIMETER CLOSURE SYSTEM

A. Extruded 6063-T6 and 6063-T5 aluminum screw clamp-tite closure system. Thermal break perimeter system shall be factory prefabricated with "U" = .50 or less.

B. All battens and perimeter closures to be supplied with 410 series stainless steel screws (excluding fasteners to the building).

C. Head, sill, jamb type channel members, closure members, and interior angles to have a minimum fillet of 0.090-inch to ensure strength at point of greatest stress.

D. Fasteners to the building shall be 300 Series stainless steel screws or bolts in expansion anchors of the size required to support the window system and as recommended by manufacturer.

2.5 FLEXIBLE SEALING TAPE

A. Sealing tape shall be manufacturer's standard pre-applied to closure system at the factory under controlled conditions.

2.6 FINISHES

A. Aluminum Polyvinylidene Fluoride Based Coating: Apply full strength polyvinylidene fluoride based coatings at the factory by coil coating for sheet material and spray coating for extruded material. Comply with the following:
   1. Alkali clean and hot water rinse all surfaces to receive polyvinylidene fluoride based finish.
   2. Prepare a chemical conversion coating on the surface, using phosphates or chromates followed by a cold water rinse. Seal with a chromic acid rinse and dry, except where panel manufacturer recommends another method to achieve greater coating reliability.
   3. Apply a base prime coat of epoxy paint to the prepared surface in its coil form, by reverse roller coating. Fully cure in a gas-fired oven to a dry film thickness of 0.2 - 0.4 mils.
   4. Apply finish coating over the primer by roller coating for coil material and airless or Ransburg Elastrostatic Hand Spray for extrusions and fuse at a peak metal temperature of 440 F for a dry film thickness of 0.7 mils for coil coating and 1.2 mils for spray coating so that the total dry film is approximately 1.0 mil thick for coil material and 1.5 mils thick for extruded material.
   5. Provide the following physical properties, as proven by appropriate and recognized laboratory test methods acceptable to ENGINEER:
      a. Weathering, ASTM D 659: Chalking, not more than No. 8, after exposure for 5000 hours in Sunshine Arc Weatherometer XWR using 60/60 cycle.

b. Color Change, ASTM D 2244: No greater than 5 N.B.S units after removal of external deposits and after exposure for 5000 hours in Sunshine Arc Weatherometer XWR using 60/60 cycle.
c. Humidity Resistance, ASTM D 2247; few scattered blisters no larger than ASTM No. 4, after 1000 hours.
d. Salt Spray, ASTM B 117: Few scattered blisters no larger than ASTM No. 4, and no more than 1/16-inch creep from areas scribed to bare metal after 500 hours.
e. Dry Adhesion: No pick-off when tape tested over 1/16-inch cross hatch.
f. Wet Adhesion: No pick-off when tape tested over 1/16-inch cross hatch; extruded material only.
g. Boiling Water Adhesion: No pick-off when tape tested over cross hatch area after 1-hour immersion in distilled boiling water.
h. Water Immersion: No pick-off when tape tested over cross hatch area after immersion in aerated distilled water 80 ∀10F after 500 hours.
i. Abrasion Resistance, ASTM D 968: Coefficient of abrasion of 67 minimum.
j. Gloss, ASTM D 523: 30∀5 reflectivity at 60 F.
k. Pencil Hardness: F minimum.
l. Dry Film Thickness: Primer, 0.2-0.4 mils, polyvinylidene fluoride based coating, 0.7-1.5 mils.
m. Solvent Resistance: 100 Double MEK rubs minimum.
n. Flexibility, ASTM D 1737: No cracking prior to metal fracture.
o. Acid Resistance, ASTM D 1308: 16-hour spot test with 5% hydrochloric acid - no effect.
p. Alkali Resistance, ASTM D 1308: 16-hour spot test with 5% sodium hydroxide - no effect.

B. Color: Finish color of battens and perimeter closure is to be selected by ENGINEER.

C. Product and Manufacturer: Provide one of the following:
1. Kynar 500 Fluropon by DeSoto Incorporated.
2. Kynar 500 Duranar by PPG Industries, Incorporated.
3. KCRF Organic Coating by Kalwall Corporation.

PART 3 - EXECUTION

3.1 INSPECTION

A. CONTRACTOR and his installer must examine the substrate and conditions under which insulated translucent wall panel system Work is to be installed and notify ENGINEER in writing of any conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until satisfactory conditions have been corrected in a manner acceptable to ENGINEER.

3.2 INSTALLATION

A. Comply with manufacturer's specifications and recommendations for the installation of FRP window system.

B. Set units plumb, level and true to line, without warp or rack of frames or sash. Anchor securely in place. Separate aluminum and other corrodible metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

C. Refer to Section 07920, Joint Sealants.

3.3 ADJUSTMENT AND CLEANING

A. Clean aluminum surfaces promptly after installation, exercising care to avoid damage of the finish. Remove excess glazing and sealant compounds, dirt and other substances.

B. Advise CONTRACTOR of protective treatment and other precautions required through the remainder of the construction period, to ensure that window units will be without damage or deterioration, other than normal weathering, at the time of Final Acceptance.

++ END OF SECTION ++

SECTION 09 61 53

CONCRETE HARDENER

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install all concrete hardener Work.
   2. The extent of the concrete hardener includes all interior concrete floors not shown or scheduled to be finished with another material.
   3. The types of concrete hardener Work required include, but are not necessarily limited to, silicate penetrant.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before, the concrete hardener Work.
   2. Notify other contractors in advance of the installation of the concrete hardener Work to provide them with sufficient time for the installation of items included in their contracts that must be installed with, or before, the concrete hardener Work.

C. Related Sections:
   1. Section 03 30 00, Cast-in-Place Concrete.

1.2 QUALITY ASSURANCE

A. Installer's Qualifications: Engage a single installer regularly engaged in the installation of concrete hardeners with five years experience in the application of the types of materials required, and who agrees to employ only tradesmen with specific skills and experience in this type of Work. Installer shall meet the requirements of the concrete hardener manufacturer for providing guarantee coverage. Submit name and qualifications to ENGINEER.

B. Source Quality Control: Obtain all material from only one manufacturer who will send a qualified technical representative to the Site for the purpose of advising the installer of proper procedures and precautions for the use of the material, at no additional cost to the DEPARTMENT.

1.3 SUBMITTALS

A. Shop Drawings: Submit the following:

1. Copies of manufacturer's specifications, recommendations and installation instructions. Include manufacturer's published data, indicating the material complies with the requirements and is intended for the application shown.
2. Submit installer's qualifications in accordance with Article 1.2, above.

B. Certificates: Submit a certificate of coverage signed by a duly authorized representative of the manufacturer.

C. Maintenance Data: Upon completion of the Work, furnish five copies of detailed maintenance manual including the following information:
1. Product name and number.
2. Name, address and telephone number of manufacturer and local distributor.
3. Detailed procedures for routine maintenance and cleaning.
4. Detailed procedure for light repair such as scratches and staining.

D. Guarantee: Submit for approval written guarantee agreeing to replace the concrete hardener should it fail to perform as specified in Article 1.6, below.

1.4 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:
1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices which are to be embedded, in ample time to prevent delay of that Work.
2. Deliver materials in concrete hardener manufacturer's original unopened containers.
3. Include the following information on the label:
   a. Name of material and supplier.
   b. Formula or specification number, lot number and date of manufacturer.
   c. Mixing instructions, shelf life and curing time when applicable.
4. Failure to comply with these requirements shall be sufficient cause for the rejection of the material in question, by ENGINEER, and requiring its removal from the Site. In such a case, supply new material conforming to the specified requirements, at no additional cost to DEPARTMENT.
5. Handle materials carefully to prevent inclusion of foreign materials.
6. Do not open containers or mix components until all necessary preparatory Work has been completed.

B. Storage and Protection:
1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
2. Store materials so as to preclude the inclusion of foreign material.
3. Protect material from freezing.

C. Acceptance at Site:
1. All boxes, crates and packages shall be inspected by CONTRACTOR upon

delivery to the Site. CONTRACTOR shall notify ENGINEER, in writing, if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

1.5 JOB CONDITIONS

A. Environmental Conditions:
   1. Do not apply concrete hardener to uncured concrete. Comply with manufacturer's written instructions for minimum ten days of curing time.
   2. Apply hardener only when temperature of concrete is 50°F or above.

B. Protection:
   1. Do not allow concrete hardener to overflow or spill onto adjoining surfaces.
   2. Remove concrete hardener that is splashed on surfaces not designated to receive concrete hardener immediately by flushing with water.

C. Sequencing:
   1. Coordinate the Work so that the concrete hardener is installed when best results will be obtained, as recommended by the manufacturer's technical representative.

1.6 GUARANTEE

A. Provide a five-year written guarantee, signed by CONTRACTOR and installer, stating that should concrete floors show signs of dusting because of wear and abrasion they will be re-installed, in the manner specified herein, at no additional cost to DEPARTMENT, from the date of Final Acceptance of the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete Hardener: Provide a clear, colorless, aqueous solution of chemically active silicates and fluosilicates plus a wetting and penetrating agent, that reacts with the free lime and calcium carbonates to bind soft, loose particles together and form a hard dense vitreous surface which is resistant to chemical attack and the growth of mildew, fungi, and other organisms. Use potable water only.

2.2 MANUFACTURERS

A. Products and Manufacturers: Provide one of the following:
   1. Lapidolith by Sonneborn Division of Contech, Incorporated.
   2. Armortop by Anti-Hydro Waterproofing Company.
   3. Or equal.

2.3 MIXES

A. Follow manufacturer's written instructions for the proper mixing, dilution and coverage of each coat.

2.4 FINISH

A. The finished installation of the concrete hardener shall have a smooth, uniform even finish without discontinuities or discolorations.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the substrates and the conditions under which the concrete hardener Work is to be performed and notify ENGINEER in writing of any conditions detrimental to the proper and timely completion of the Work and performance of the concrete hardener. Do not proceed with the concrete hardener Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

3.2 SUBSTRATE PREPARATION

A. Steel trowel concrete in strict accordance with printed directions supplied by the concrete hardener manufacturer.

B. Provide concrete free of all honeycombing and fins.

C. Do not use sealers, curing or parting compounds on the concrete.

D. Provide wet curing only.

E. Surfaces to receive concrete hardener shall be clean, dry and free of all loose dirt, oil, wax and other foreign matter.

3.3 INSTALLATION

A. Provide the services of a manufacturer's technical representative for the purpose of advising the installer of proper procedures and precautions for the use of the material prior and during the installation of the concrete hardener.

B. Apply concrete hardener using the coverage recommended by the manufacturer per coat.

C. Apply a minimum of three separate coats.

D. Apply a fourth coat using undiluted material should the manufacturer's technical representative recommend this procedure, based on field conditions, and as directed by ENGINEER.

E. Apply each coat by spray.
F. Mop up excess solution or puddles.

G. After each of the first and second applications, allow the floor to dry until no longer visibly wet.

H. To avoid the development of crystals, when applying the third coat, flush the surface liberally with clean, hot water. At the same time, brush the floor rapidly with a stiff-bristle broom. Mop up excess water.

I. Follow manufacturer's written instructions should white crystals develop after the first or second coat. Consult manufacturer's technical representative.

3.4 ADJUSTMENT AND CLEANING

A. Clean adjacent surfaces of concrete hardener resulting from the Work. Use solvent or cleaning agent recommended by the concrete hardener manufacturer. Leave all finished Work in a clean neat appearance.

B. Protect the concrete hardener until fully cured.

+ + END OF SECTION + +

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SECTION 09 91 00

PAINTING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, tools, equipment, and incidentals as shown, specified and required to furnish and apply paint systems.
      a. CONTRACTOR is responsible for surface preparation and painting of all new and existing interior and exterior items and surfaces throughout the Project areas included in the general contract and other contracts described in this Section.
   2. Extent of painting is specified and includes the following. Painting shown in schedules may not provide CONTRACTOR with complete indication of all painting Work. CONTRACTOR is directed to Paragraph 2.2 where all surfaces of the generic types specified shall be prepared and painted according to their status, intended function and location, using the painting system for that surface, function and location as specified, unless specifically identified on the Drawings or listed in this Section as a surface not to receive specified painting system.
      a. Surfaces and items not to be painted:
         1) Colored masonry.
         2) Concrete floors with hardeners and or sealants.
         3) Stainless steel piping.
         4) PVC piping.
         5) CPVC piping.
         6) HDPE piping.
         7) Nuts and bolts at pipe flanges.
         8) Galvanized pipe supports.
         9) Shop-coated pipe supports.
         10) Stainless steel.
         11) Aluminum.
         12) FRP grating, handrails, and structural shapes.
         13) FRP tanks that are pigmented.
         14) Motors.
         15) Electrical panels, disconnect switches, switchgear, and transformers.
         16) Electrical conduits.
         17) Control panels.
         18) Gauges and diaphragm seals.
         19) Instrumentation including pilot lines.

20) Valves (plastic body).
21) Valves (metallic body that are shop primed or finished coated).
22) Valve and equipment tags.

b. Surfaces and items to be painted: All new surfaces and items except where the natural finish of the material is specified as a corrosion-resistant material not requiring paint; or is specifically shown as indicated by written note, or specified as a surface not to be painted, shall be painted. Where items or surfaces are not specifically mentioned, paint them the same as adjacent similar materials or areas.

c. Surface preparation and painting of all new items, both interior and exterior, and other surfaces, including items furnished by DEPARTMENT, are included in the Work, except as otherwise shown or specified.

d. Remove all substances, top coats, primers and all intermediate coats of paint and other protective or decorative toppings on those items and surfaces to remain that are identified to receive a painting system under this Section, in order to provide surfaces acceptable for application of painting system specified.

e. Stepped-down mock-ups, with acceptable variations in color, prepared by the CONTRACTOR for all painting systems showing all components of the surface preparation and paint system application shall be approved by ENGINEER before the start of any Work. Check all dry film thicknesses; demonstrate methods of surface preparation and methods of application in addition to obtaining ENGINEER's approval of colors and textures to be used in the Work.

3. Change order management: After the Schedule of Values has been accepted, and prior to painting, CONTRACTOR shall breakdown the value associated with each item to be painted with the sum totaling the amount listed in the Schedule of Values. This breakdown will be the basis for negotiating changes in the Contract related to painting.

B. Coordination:

1. Review installation, removal and demolition procedures under other Sections and coordinate them with the Work specified herein.
2. Notify other contractors in advance of the surface preparation and painting Work included in this Section to provide them sufficient time for installation, removal, demolition and coordination of interrelated items that are included in their contracts and that must be installed, removed or demolished in coordination with the painting Work.
3. Coordinate the painting of areas that will become inaccessible once equipment has been installed. Paint inaccessible areas prior to installation.
4. Coordinate primers with finish paint materials in order to provide primers that are compatible with finish paint materials used. Review other Sections and other contracts where primed surfaces are to be provided, to ensure compatibility of the total painting system for the various surfaces.

CONTRACTOR shall be responsible for coordinating the compatibility of all shop primed and field painted items in other Sections.

5. Furnish information to ENGINEER on the characteristics of the finish materials proposed for use, to ensure that compatible prime coats are used. Provide barrier coats over incompatible primers or remove and repaint as required. Notify ENGINEER, in writing, of anticipated problems using the specified painting systems with surfaces primed by others. Re-prime all equipment primed in the factory and other factory-primed items that are damaged, or scratched.

C. Related Sections:
   1. Section 07 92 00, Joint Sealants.

D. Work Not Included: The following categories of Work are not included as part of the painting Work, or are included in other Sections:
   1. Shop Priming: Shop priming of structural metal, miscellaneous metal fabrications, other metal items and fabricated components such as shop-fabricated or factory-built heating and ventilating and electrical equipment or accessories shall conform to applicable requirements of this Section but are included under other Sections or in the general and other contracts.
   2. Pre-finished Items:
      a. Items furnished with such finishes as baked-on enamel, porcelain and polyvinylidene fluoride shall only be touched up at the Site by CONTRACTOR using manufacturer's recommended compatible field-applied touchup paint.
      b. Items furnished with such finishes as chrome plating or anodizing.
   3. Concealed Surfaces: Non-metallic wall or ceiling surfaces in areas not exposed-to-view, and generally inaccessible areas, such as furred spaces, pipe chases and duct and elevator shafts.
   4. Concrete floors, concrete and masonry walls, and equipment/tank pads unless specifically shown as a surface to be painted.
   5. Corrosion-Resistant Metal Surfaces: Where the natural oxide of the item forms a barrier to corrosion, whether factory- or Site-formed, including such materials as copper, bronze, muntz metal, zinc, terne metal and stainless steel.
   6. Operating Parts and Labels:
      a. Do not paint moving parts of operating units, mechanical and electrical parts such as valve and damper operators, linkages, sensing devices, interior of motors and fan shafts.
      b. Do not paint over labels required by governing authorities having jurisdiction at the Site, or any equipment identification, performance rating, name or nomenclature plates.
      c. Cover moving parts and labels during the painting Work with protective masking. Remove all protective masking upon completion of Work. Remove all paint, coatings or splatter which comes in contact with such labels.

E. Description of Colors and Finishes:
   1. Color Selection:
      a. Colors and color-coding shall be selected by ENGINEER during submittal review. In general, color selection will be consistent with the requirements of ANSI A13.1, ANSI Z535.1 and CFR 1910.144.b. ENGINEER reserves the right to select all non-standard colors for all paint systems specified within the ability of one or more manufacturers to produce such non-standard colors. CONTRACTOR shall supply such colors at no additional expense to DEPARTMENT.
   2. Color Coding of Pipelines, Valves, Equipment and Ducts:
      a. CONTRACTOR shall color-code pipelines, equipment, and ducts. Color-coding for pipelines shall be selected by the ENGINEER with different colors and possibly including bands of different colors for each pipeline system.
      b. For equipment located on roofs or where exposed-to-view such as on exterior building facades, or in offices or lobbies, the color shall be selected by ENGINEER.
      c. Finish coats of paint for pipelines and equipment whenever possible, shall be coded in standard colors. The color of the final coats shall match as closely as possible the sample color selected, without custom blending, the color for each specific pipeline service. In safety applications, colors shall be brilliant, distinctive shades in accordance with ANSI Z535.1.
   3. After approval by ENGINEER of colors and Shop Drawing submittals and prior to beginning painting Work, ENGINEER will furnish color schedules for surfaces to be painted listed in Article 2.2, below.

F. Abbreviations and Symbols:
   1. Abbreviations and symbols used in painting systems are explained in Paragraph 2.2, below, and provide information on generic composition of the required materials, manufacturers, number of coats and their dry mil film thickness per coat (DMFTPC) and coverage for calculating the required number of gallons for the Work.

1.2 REFERENCES

A. Referenced Standards: Standards referenced in this Section are listed below:
   1. ANSI A13.1, Scheme for Identification of Piping Systems.
   2. ANSI Z535.1, Safety Color Code.
   3. ANSI/NSF Standard 60, Drinking Water Treatment Chemicals - Health Effects.
   4. ANSI/NSF Standard 61, Drinking Water System Components – Health Effects.
   5. ASTM D16, Terminology for Paint, Related Coatings, Materials and Applications.

6. ASTM D2200, Pictoral Surface Preparation Standards for Painting Steel Surfaces.
7. ASTM D4258, Practice for Surface Cleaning Concrete for Coating.
8. ASTM D4259, Practice for Abrading Concrete.
9. ASTM D4262, Testing Method for pH of Chemically Cleaned or Etched Concrete Surfaces.
10. ASTM D4263, Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
11. ASTM D4285, Test Method for Indicating Oil or Water in Compressed Air.
12. ASTM D4417, Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel.
13. ASTM D4541, Test Methods for Pull-Off Strength of Coatings Using Portable Adhesion-Testers.
14. ASTM E329, Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.
15. AWWA C652, Disinfection of Water-Storage Facilities.
16. AWWA D102, Coating Steel Water-Storage Tanks.
17. Code of Federal Regulations, 29 CFR 1910.144, Safety Color Code for Marking Physical Hazards.
18. Green Seal, Incorporated, Paint, (GS-11).
19. OTC Model Rule for Architectural and Industrial Maintenance Coatings.
20. SSPC PA 2, Measurement of Dry Coating Thickness with Magnetic Gages.
21. SSPC SP 1, Solvent Cleaning.
22. SSPC SP 3, Power Tool Cleaning.
23. SSPC SP 6, Commercial Blast Cleaning.
24. SSPC SP 10, Near-White Blast Cleaning.
25. SSPC SP 11, Power Tool Cleaning To Bare Metal.
26. SSPC VIS 1, Visual Standard for Abrasive Blast Cleaned Steel.
27. SSPC VIS 2, Method of Evaluating Degree of Rusting/Painted Steel Surfaces.
28. SSPC Volume 2, Systems and Specifications.
29. 40 CFR, Subpart D-2001, National Volatile Organic Compound Emission Standards for Architectural Coatings.
30. Resource Conservation and Recovery Act of 1976, (RCRA).
31. SW-846, Toxic Characteristic Leaching Procedure, (TCLP).

1.3 DEFINITIONS

A. Standard coating terms defined in ASTM D16 apply to this Section, including the following:
   1. Paint: Pretreatment and all painting system materials, such as primer, emulsion, enamel, organic/inorganic polymer coating, stain sealer and filler, and other applied materials whether used as prime, filler, intermediate or finish coats.
   2. Exposed: All items not covered with cement plaster, concrete or fireproofing. Items covered with these materials shall be provided with specified primer

only, except where specified as a surface not to be painted. Exposed-to-view surfaces also include those areas visible after permanent or built-in fixtures, convector covers, ceiling tile, covers for finned tube radiation, grilles, lockers, etc. are in-place, in areas to be painted.

3. Low VOC: All interior and exterior field-applied coatings shall have maximum VOC content as listed in OTC Model Role for Architectural and Industrial Maintenance Coatings.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications:
   1. Engage a single applicator regularly performing installation of paint materials, with documented skill and successful experience in the installation of the types of materials required and who agrees to employ only tradesmen who are trained, skilled and have successful experience in installing the types of materials specified.
   2. Submit name and qualifications to ENGINEER along with the following information on a minimum of three successful projects:
      a. Names and telephone numbers of owners, architects or engineers responsible for projects.
      b. Approximate contract cost of the paint materials.
      c. Amount of area installed.
   3. Submit proof of acceptability of applicator by manufacturer to ENGINEER.

B. Source Quality Control:
   1. Obtain materials only from manufacturers who will provide the services of a qualified manufacturer's representative at the Site, at the commencement of painting Work, to advise on materials, mock-ups, installation and finishing techniques, at the completion of the Work to advise ENGINEER on the acceptability of completed Work, and during the course of the Work as may be requested by ENGINEER.
   2. Certify long-term compatibility of all coatings with surfaces.
   3. Do not submit products that decrease the number of coats, the surface preparation, or the generic type and formulation of coating(s) specified. Products exceeding VOC limits and chemical content specified will not be approved.
   4. ENGINEER may review manufacturers' recommendations concerning methods of installation and number of coats of paint for each painting system. When requested by ENGINEER, CONTRACTOR shall prepare construction cost estimates based on preparation methods, painting systems, number of coats, coverage’s and installation methods specified.
   5. All proposed "or equal" products shall be submitted with direct comparison to products specified including information on durability, adhesion, color and gloss retention, percent solids, VOC's grams per liter and re-coatability after curing.

6. “Or equal” manufacturers shall furnish the same color selection as the manufacturers specified, including intense chroma and custom pigmented colors in all painting systems.
7. Color Pigments: Provide pure, non-fading, applicable types to suit the surfaces and services indicated. Comply with the following:
   a. Lead and Chromate: Lead and chromate content shall not exceed amount permitted by governing authorities having jurisdiction.
   b. Manufacturer shall identify colors that meet the requirements of governing authorities having jurisdiction at the Site for use in locations subject to contact with potable water or water being prepared for use as potable water.
   c. Comply with manufacturers' recommendations on preventing coating contact with levels of carbon dioxide and carbon monoxide that may cause yellowing during application and initial stages of curing of paint coatings.
8. Obtain each product from only one manufacturer. Multiple manufacturing sources for the same system component will not be approved by ENGINEER.
9. Certify product shelf life history for each product source for materials manufactured by the same manufacturer, but purchased and stored at different locations or obtained from different sources.
10. Constantly store materials to be used in the painting Work between 60 and 90 degrees F, and in accordance with the manufacturer’s approved written recommendations, for not more than six months. Certify to ENGINEER that painting materials have been manufactured within six months of installation and have not, nor will be, subjected to freezing temperatures.

D. Regulatory Requirements:
   1. Painting systems for surfaces in contact with potable water, or water being treated for potable use, shall be NSF certified, applied in conformance with NSF certification, and shall not impart any taste or odor to the water or result in any organic or inorganic content in excess of the maximum allowable contaminant level established by governing authorities having jurisdiction at the Site. CONTRACTOR shall revise painting systems specified herein to provide NSF certified compliant painting system(s).
   2. Comply with CONTRACTOR’S safety procedures and governing authorities having jurisdiction at the Site for blast cleaning operations, confined space entry and disposition of spent abrasive and debris.

E. Stepped-Down Mock-Ups:
   1. Demonstrate installation of specified painting system(s) on actual wall surfaces and building components at locations selected by ENGINEER.
   2. ENGINEER may approve or disapprove each component of each painting system on an individual component basis.

F. Pre-Painting Conference:

1. Prior to the installation of painting systems, CONTRACTOR shall arrange a meeting at the Site with painting applicator and its foreman, the paint manufacturer's technical representative when requested by ENGINEER or CONTRACTOR, the installers of other work in and around the painting system Work that must follow the painting Work, ENGINEER and other representatives directly concerned with performance of the painting Work. CONTRACTOR shall record the discussions of the conference and the decisions and agreements (or disagreements) and furnish a copy of the record to each party attending. Review foreseeable methods and procedures relating to the painting Work, including but not necessarily limited to, the following:
    a. Review Project requirements including Drawings, Specifications, approved Shop Drawings, pending and approved Change Orders and requests for information that may have been submitted by CONTRACTOR to ENGINEER.
    b. Review required samples and submittals, both completed and yet to be completed.
    c. Review status of surfaces including drying, surface preparations and similar considerations.
    d. Review availability of materials, tradesman, equipment and facilities needed to make progress, avoid delays and protect the Work from damaging conditions.
    e. Review required inspection, testing, certifying and quality control procedures.
    f. Review weather and forecasted weather conditions, and procedures for coping with unfavorable conditions. Supplemental heating sources, as may be required to continue the Work under low temperature conditions, shall be in operating order and acceptable to paint applicator.
    g. Review methods for complying with regulations of governing authorities having jurisdiction at the Site, such as compliance with environmental protection, ventilation, health, safety, fire and similar regulations.
    h. Review laws and procedures covering the removal and disposal of blast debris.
2. Reconvene the meeting at the earliest opportunity if additional information must be developed in order to conclude the subjects under consideration.
3. Record any revisions or changes agreed upon, reasons therefore, and parties agreeing or disagreeing with them.

1.5 SUBMITTALS

A. Qualifications Data: Submit qualifications data as specified in Article 1.4 for:
    1. Applicator.

B. Samples: Submit the following:
    1. Recommended paint types.
    2. Copies of manufacturer's complete color charts for each coating system.

C. Shop Drawings: Submit the following:
   1. Copies of manufacturer's technical information and test performance data, including paint analysis, VOC and chemical component content in comparison to maximum allowed by these Specifications, and application instructions for each material proposed for use.
   2. Submit proof of acceptability of proposed application techniques by the paint manufacturer selected.
   3. List each material and cross-reference to the specific painting system and application. Identify by manufacturer's catalog number and general classification. State number of gallons of each product being purchased for delivery to the Site and the square foot area calculated to be covered by each painting system specified based on theoretical loss of 20 percent. Where actual area to be covered by any paint system exceeds the area submitted to ENGINEER for that system, proof of additional material purchase shall be submitted to ENGINEER. Calculated coverage shall be as specified for each component of each painting system specified. This requirement shall not take precedence over CONTRACTOR's responsibility to provide dry film thickness required for each component of each painting system.
   4. Identify maximum exposure times allowable for each paint system component before the next coat of paint must be applied. Submit proposed methods for preparing surfaces for subsequent coats if maximum exposure times are exceeded.
   5. Information on curing times and environmental conditions that affect the curing time of each system component and proposed methods for accommodating variations in curing time. Identify this information for each painting system used in the Work.
   6. Specification for spray equipment with cross-reference to paint manufacturer's recommended equipment requirements.
   7. MSDS sheets for each paint to be applied.

1.6 DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials: Deliver all materials to the Site in original, new and unopened packages and containers, accurately and legibly labeled with manufacturer's name and with label accurately describing container contents, and with the following information:
   1. Name and generic description of material.
   2. Manufacturer's stock number and date of manufacture.
   3. Manufacturer's name.
   4. Contents by volume, for major pigment and vehicle constituents.
   5. Grams per liter of volatile organic compounds.
   6. Thinning instructions, where recommended.
   7. Application instructions.
   8. Color name and number.

B. Storage of Materials:

1. Store only acceptable materials at the Site and in locations that cannot contaminate surfaces that will be used to produce potable water. Store in location acceptable to ENGINEER.
2. Store in an environmentally controlled location as recommended by paint manufacturer's approved written product information guidelines. Keep area clean and accessible.
3. Store materials not in actual use, in tightly covered containers.
4. Comply with health and fire regulations of governing authorities having jurisdiction at the Site.

C. Handling of Materials:
1. Handle materials in a manner, which precludes the possibility of spillage into areas that could contaminate water, product contamination, or incorrect product catalyzation.
2. Do not open containers or mix components until necessary preparatory Work has been completed and approved by ENGINEER and painting Work will start immediately.
3. Maintain containers used in storage, mixing, and application of paint in a clean condition, free of foreign materials and residue.

1.7 PROJECT CONDITIONS

A. Site Facilities:
1. Supplemental heat sources, as may be required to maintain both ambient and surface temperatures within the range recommended by the manufacturer for paint system applications, are not available at the Site.
2. The provision of all supplemental heat energy sources, power, equipment and operating, maintenance and temperature monitoring personnel is the responsibility of CONTRACTOR.
3. Do not use heat sources, which emit carbon dioxide or carbon monoxide into areas being painted. Properly locate and vent all such heat sources to the exterior such that paint systems are unaffected by exhaust products.

B. Existing Conditions:
1. Existing surfaces specified to be painted as part of the Work shall have their surfaces prepared to meet the requirements of the painting systems specified. Paints to be used shall meet manufacturer recommendations for the surfaces being painted. For example, paints to be used in high temperature environments shall meet manufacturer guidelines for such environments.
2. Abrasive blasting, scraping or other abrading or surface film removal, or preparatory techniques as approved by ENGINEER shall be provided as part of the Work.
3. Before painting starts in any area, all surfaces to be painted and floors shall be cleaned of all dust using commercial vacuum cleaning equipment and dust containment systems. Protect electrical equipment from dust and paint fumes.

C. Environmental Requirements:

1. Apply all paints in strict accordance with manufacturer's instructions.
2. Surfaces to be painted shall be at least 5 degrees F above the dew point temperature and shall be dry to the touch. Apply paints only when the temperature of surfaces to be painted, paint material, and the surrounding air temperatures are between 65 and 95 degrees F, unless otherwise permitted by the paint manufacturer's printed instructions.
3. Apply paint system within the shortest possible time consistent with manufacturer's approved recommended curing instructions for each coat. If chemical, salt, or other contamination contacts paint film between coats, it shall be removed in accordance with SSPC SP 1, and the surface restored before applying remainder of painting system.
4. Tanks containing water shall not be painted without specific permission of ENGINEER, in writing, and only under conditions where "sweating" of the tank outside surface is not likely to occur within 24 hours of application.
5. Epoxy paints shall not be applied if ambient temperature is expected to go below 50 degrees F within 12 hours of application. Where manufacturer's printed recommendations require a higher minimum ambient temperature, this shall be followed.
6. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; to damp or wet surfaces or when surfaces will reach dew point due to falling or rising temperatures and humidity conditions during the course of the paint application, unless otherwise permitted by the paint manufacturer's printed instructions.
7. Do not paint pipelines and other unacceptably hot or cold surfaces until such surfaces can be maintained within temperature and dew point ranges acceptable to manufacturer. CONTRACTOR shall arrange for such surfaces to be brought within acceptable temperature and dew point ranges as part of the painting Work.
8. Moisture content of surfaces shall be verified to ENGINEER as acceptable to permit the commencement of the painting Work using methods recommended by the specified manufacturer.
9. Painting may be continued during inclement weather only if the areas and surfaces to be painted are enclosed and heated within the temperature limits specified by the paint manufacturer during application and drying periods.
10. Provide adequate illumination and ventilation in all areas where painting operations are in progress.

D. Protection:

1. Cover or otherwise protect finished Work of other trades and surfaces not being painted concurrently or not to be painted.
2. Provide fire extinguishers and post caution signs warning against smoking and open flame when working with flammable materials.

E. Testing:

1. CONTRACTOR shall perform testing of waste materials and existing paint required under federal, state, or local regulations.

1.8 MAINTENANCE

A. Furnish, tag, and store an additional one gallon of all coatings and colors installed. Store in a location, in unopened containers, as directed by the ENGINEER.

PART 2 - PRODUCTS

2.1 PAINTING SYSTEM MANUFACTURERS

A. Products and Manufacturers: Where referenced under painting systems, provide painting systems as manufactured by one or more of the following:
   1. Tnemec Company, Incorporated, (TCI).
   2. The Carboline Company, part of the StonCor Group, an RMP Company, (TCC).
   3. The Sherwin-Williams Company, (SWC).
   4. Benjamin Moore & Company, (BMC).

2.2 PAINTING SYSTEMS

A. New Cast-In-Place Concrete Walls, Columns, Underside of Beams, Architectural Precast Concrete; Moderate Corrosion and Abrasion- Resistant, Non-Submerged, Interior:
   1. Surface Preparation: Refer to Paragraphs 1.5.B.1, 3.2.A., 3.2.B.3., 3.2.B.5., 3.2.B.6. and 3.2.B.7.
   2. Filler, Surfacer and Patching Compound:
      a. Generic Components:
         1) Minimum 100 percent solids, epoxy modified cement; 40 grams per liter VOC, maximum.
      b. Products and Manufacturers: Provide one of the following:
         1) Series 218 MortarClad and Series 219 MortarCast (TCI); Carboguard 501/510 (TCC); Cor-Cote Epoxy Polymer Concrete or TPM 721 Repair and Leveling Mortar (SWC): - one coat, hand troweled-in-place up to 2-inches deep for patching and applied 1/16-inch thick continuously over all surfaces specified to receive this painting system, 20 square feet per gallon (excluding patched areas); and provided in sufficient additional quantity to bring all surfaces to a smooth, uniform continuously coated plane, of thickness specified.
   3. Primer/Intermediate:
      a. Generic Components:
         1) Minimum 42 percent solids, waterborne acrylic epoxy; 240 grams per liter VOC, maximum.

b. Products and Manufacturers: Provide one of the following:
1) Series 113 H.B. Tneme-Tufcoat (TCI); Sanitile 255 (TCC); Epo-Plex Multi-Mil (SWC): - two coats, 5.0 dry mils, per coat.

4. Finish: Gloss:
a. Generic Components:
1) Minimum 42 percent solids, waterborne acrylic or water-based epoxy; 285 grams per liter VOC, maximum.
b. Products and Manufacturers: Provide one of the following:
1) Series 114 Tneme-Tufcoat UR (TCI); Sanitile 255 (TCC); Waterborne Epoxy 3479 (SWC): - one coat, 2.0 to 3.0 dry mils.

B. New Ferrous Metals, Structural Steel, Miscellaneous Ferrous Metals, Exterior Surfaces of metal body Valves, Exterior Surfaces of Ferrous Piping and Exterior Surfaces of all Ferrous Piping (Both Exposed and to be Later Covered With Insulation); Non-submerged, Interior:
1. Surface Preparation: Refer to Paragraphs 1.5.B.1., 3.2.A., 3.2.C.1., 3.2.C.2., 3.2.C.4., 3.2.C.6., 3.2.C.7. and 3.2.C.8.
2. Shop Primer:
a. Generic Components:
1) Minimum 67 percent volume solids, build, two-component, cycloaliphatic amine-catalyzed epoxy or polyamido-amine epoxy coating; 250 grams per liter VOC, maximum.
b. Products and Manufacturers: Provide one of the following:
1) Series N69 Hi-Build Epoxoline (TCI); Carboguard 954 HB (TCC); Macropoxy HS Epoxy (SWC): - one coat, 4.0 to 6.0 dry mils.
3. Field Primer and Touch-Up:
a. Generic Components:
1) Minimum 100 percent volume solids, high-build, two-component, polyamide-catalyzed epoxy; 8 grams per gallon VOC, maximum.
b. Products and Manufacturers: Provide one of the following:
1) Series 165 Epoxoline 100 (TCI); Carboguard 954 HB (TCC); Cor-Cote HP (SWC): - one coat, 8.0 to 12.0 dry mils.
4. Finish: High-Gloss:
a. Generic Components:
1) Minimum 80 percent volume solids, high-build, chemical-resistant, high-gloss, modified, polyamine- or polyamidoamine-catalyzed epoxy finish; 25 grams per liter VOC, maximum.
b. Products and Manufacturers: Provide one of the following:
1) Series 280 Tneme-Glaze (TCI); Carboguard 890 LT (TCC); Cor-Cote HP (SWC):
a) Horizontal Surfaces: One coat, 6.0 to 12.0 dry mils.
b) Vertical Surfaces: One coat, 4.0 to 8.0 dry mils.

C. New and Existing Ferrous Metals, Interior surfaces at Ambient Temperatures, Galvanized Metals and Non-Ferrous Metals and Exterior Surfaces of Piping;

Intermittently Submerged and Submerged; Certified by NSF International in accordance with ANSI/NSF Standard 61; Moderate VOC Content, Interior:

1. Surface Preparation: Refer to Paragraphs 1.5.B.1., 3.2.A., 3.2.C.1., 3.2.C.3., 3.2.C.5., 3.2.D. and 3.2.E.
2. Primer/Finish:
   a. Generic Components:
      1) Minimum 68 percent solids, polyamidoamine epoxy or cycloaliphatic amine epoxy; 250 grams per liter VOC, maximum.
   b. Products and Manufacturers: Provide one of the following:
      1) Series V140F Pota-Pox Plus (TCI); Carboguard 891 (TCC); Macropoxy 646 Epoxy NSF (SWC): - three coats, 5.0 to 8.0 dry mils, per coat.

   * In order to comply with ANSI/NSF 61 forced-cure requirements, CONTRACTOR shall provide surface temperatures of 75°F for 24 hours after application of prime coat.

   ** In order to comply with ANSI/NSF 61 forced-cure requirements, CONTRACTOR shall immediately raise temperature of surface to 75°F for a minimum of two hours and for a maximum of four hours followed by increasing temperature of substrate to 150°F for 24 hours followed by 24 hours at temperature of 75°F after application of finish coat.

D. New and Existing Ferrous Metals, Non-Ferrous Metals, and Galvanized Metals; Non-Submerged, Exterior:

1. Surface Preparation: Refer to Paragraphs 1.5.B.1., 3.2.A., 3.2.C.1., 3.2.C.2., 3.2.C.4., 3.2.C.6., 3.2.C.7., 3.2.C.8., 3.2.D., 3.2.E. and 3.2.F.
2. Ferrous Metal Shop Primer:
   a. Generic Components:
      1) Minimum 67 percent solids, polyamidoamine epoxy; 296 grams per liter, VOC, maximum.
   b. Products and Manufacturers: Provide one of the following:
      1) Series V69 Hi-Build Epoxoline (TCI); Carboguard 954 (TCC); Macropoxy HS (SWC): - one coat, 4.0 to 6.0 dry mils.
3. Galvanized and Non-Ferrous Shop Primer:
   a. Generic Components:
      1) Refer to Paragraph 2.2.S.2.a.1), above.
   b. Product and Manufacturer: Provide one of the following:
      1) Refer to Paragraph 2.2.S.2.b.1), above.
4. Intermediate (Ferrous Metals Only):
   a. Generic Components:
      1) Low Temperature Curing Conditions: Minimum 75 percent solids, cycloaliphatic amine or polyamine epoxy; 296 grams per liter VOC, maximum.
      2) Moderate Temperature Curing Conditions: Minimum 75 percent volume solids, cycloaliphatic amine or polyamine epoxy; 296 grams per liter VOC, maximum.
   b. Products and Manufacturers: Provide one of the following:

1) Series 136, Epoxoline HS (TCI); Carbguard 890 or 890 LT (TCC); Macropoxy HS (SWC): - one coat, 10.0 dry mils.
2) Series 166 Epoxoline HS (TCI); Carbguard 890 or 890 LT (TCC); Macropoxy HS (SWC): - one coat, 6.0 dry mils.

5. Finish: Semi-Gloss:
   a. Generic Components:
      1) Minimum 65 percent solids, aliphatic acrylic polyurethane; 340 grams per liter VOC, maximum.
   b. Products and Manufacturers: Provide one of the following:
      1) Series V73 Endura-Shield (TCI); Carbothane 133 VOC (TCC); Hi-Solids Aliphatic Acrylic Polyurethane (SWC): - two coats, 2.0 dry mils, per coat, 310 square feet per gallon.

E. New and Existing, Fiberglass; Non-Submerged, Exterior:
1. Surface Preparation: Refer to Paragraphs 1.5.B.1., 3.2.A., 3.2.C.1., 3.2.C.2., 3.2.C.4., 3.2.C.6., 3.2.C.7., 3.2.C.8., 3.2.D., 3.2.E. and 3.2.F.
2. Primer:
   a. Generic Components:
      1) Minimum 17 percent solids, waterborne modified polyamide epoxy, 170 grams per liter, VOC, maximum.
   b. Products and Manufacturers: Provide one of the following:
      1) Series 151 Elasto-Grip FC (TCI); Sanitile 120 (TCC); Centurion WB Urethane (SWC): - one coat, 1.5 dry mils.
3. Finish: Gloss:
   a. Generic Components:
      1) Minimum 49 percent solids, two-component, aliphatic acrylic, polyurethane coating; 247 grams per liter VOC, maximum.
   b. Products and Manufacturers: Provide one of the following:
      1) Series 1080 Endura-Shield (TCI); Carbothane 134 VOC (TCC); Centurion WB Urethane (SWC): - two coats, 2.0 to 3.0 dry mils, per coat.

F. New Aluminum in Contact with Dissimilar Materials:
1. Surface Preparation: Refer to Paragraphs 1.5.B.1., 3.2.A. and 3.2.D.
2. Primer/Finish:
   a. Generic Components:
      1) Minimum 100 percent volume solids, high-build, two-component, polyamido-amine or polyamine epoxy; 49 grams per gallon VOC, maximum.
   b. Products and Manufacturers: Provide one of the following:
      1) Series 165 Epoxoline 100 (TCI); Carboguard 954 HB (TCC); Dura-Plate UHS (SWC): - two coats, 8.0 to 15.0 dry mils, per coat.

G. New and Existing Pipe and Duct Insulation, Cloth, Paper and Canvas Jacketed; Non-submerged, Interior:

1. Surface Preparation: Refer to Paragraphs 1.5.B.1., 3.2.A. and 3.2.G.
2. Primer:
   a. Generic Components:
      1) Minimum 38 percent volume solids single-component, self-cross linking acrylic primer-sealer; 159 grams per liter VOC, maximum.
   b. Products and Manufacturers: Provide one of the following:
      1) Series 115 Uni-Bond DF (TCI); Sanitile 120 (TCC); Pro-Cryl Universal Primer (SWC): - one coat, 2.0 to 4.0 dry mils.
3. Finish: Satin:
   a. Generic Components:
      1) Minimum 37 percent volume solids, single component, self-cross linking acrylic; 226 grams per liter VOC, maximum.
   b. Products and Manufacturers: Provide one of the following:
      1) Series 116 Uni-Bond (TCI); Carbocrylic 3358 (TCC); Pro-Cryl Universal Primer (SWC): - one coat, 2.0 to 4.0 dry mils.

H. New and Existing Exterior Surfaces of Steel Pipe; Buried Exterior:
1. Surface Preparation: Refer to Paragraphs 1.5.B.1., 3.2.A., 3.2.C.1., 3.2.C.3., 3.2.C.5., 3.2.C.8. and 3.2.E.
2. Primer/Finish:
   a. Generic Components:
      1) Minimum 75 percent volume solids, build, coal tar polyamide epoxy coating; 330 grams per liter VOC, maximum.
   b. Products and Manufacturers: Provide one of the following:
      1) Series 46 Hi-Build H-413 Tneme-Tar (TCI); Bitumastic 300M (TCC); Targuard (SWC): - two coats, 9.0 dry mils, per coat.

I. New Cast-In-Place Concrete Floors: Non-Submerged; Non-chemical storage areas: Interior
1. Surface Preparation: Refer to Paragraphs 1.5.B.1, 3.2.A., 3.2.B.3., 3.2.B.5., 3.2.B.6. and 3.2.B.7.
2. Epoxy Binder
   a. Products and Manufacturers:
      1) Duochem 9400 – two coats 0.015 inches thick
      2) Sikaflor 90 – 140 sf per gallon
      3) Approved Equal

J. Steel Joist Framing
1. Surface Preparation: Refer to Paragraphs 1.5.B., 3.2.A., 3.2.C.1., 3.2.C.2., 3.2.C.4., and 3.2.C.7. Prepare per SSPC-SP6-89 Commercial Blast Cleaning to remove all transport primers, rust, mil scale and achieve a minimum 1.5 mil anchor profile.
2. Shop Primer:
   a. Surface preparation and shop primer shall be applied by an approved, SSPC-QP1 certified, specialty Subcontractor. Quality Linings, 303-307-

1313, is a pre-approved specialty Subcontractor for surface preparation and shop primer application on steel galvanized roof deck.

b. Generic Components:

1) Minimum 61 percent volume solids, aromatic urethane, zinc-rich; 350 grams per liter, unthinned, VOC, maximum.

c. Products and Manufacturers: Provide one of the following:

1) Series 90-97 Tneme-Zinc - one coat, 2.5 to 3.5 dry mils.

3. Shop Intermediate Coat:

a. Products and Manufacturers: Provide one of the following:

1) Series N69F-1255 Hi-Build Epoxoline II (TCI):

2) Or equal (products of other manufacturers may be considered provided they meet or exceed the performance criteria of TCI Series N69F) - one coat, 2.0 to 4.0 dry mils. Allow to cure overnight before handling.

4. Post Erection Prep and Touch-Up:

a. Prepare all welds, uncoated steel, and damaged areas per SSPC-SP2/3 to remove loose rust, flux, and excessive weld spatter, and prime areas with Series 1 Omnithane, 3.0 dry mils (TCI). Allow to cure overnight.

b. Generic Components:

1) Minimum 67 percent volume solids, high-build, two-component, polyamide-catalyzed epoxy; 8 grams per gallon VOC, maximum.

c. Products and Manufacturers: Provide one of the following:

1) Series N69F-1255 Hi-Build Epoxoline II (TCI):

2) Or equal (products of other manufacturers may be considered provided they meet or exceed the performance criteria of TCI Series N69F) - one coat, 4.0 to 6.0 dry mils. Allow to cure overnight.

5. Field Finish Coat:

a. Generic Components:

1) Minimum 56 percent volume solids, aliphatic acrylic polyurethane.

b. Products and Manufacturers: Provide one of the following:

1) Series 73-Color (00WH-White) Endurashield (TCI); or equal (products of other manufacturers may be considered provided they meet or exceed the performance criteria of TCI Series 73) - one coat, 2.0 to 5.0 dry mils.

2.3 CALKING AND SEALANTS

A. Refer to Section 07 92 00, Joint Sealants.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions under which painting Work is to be performed and notify ENGINEER, in writing, of conditions detrimental to the proper and

timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to the formation of a durable paint film capable of performing in accordance with claims made in manufacturer's product literature for the surfaces and conditions encountered.

C. Do not paint over existing paint where there is no assurance that existing paint will provide an acceptable surface for the long-term adherence and durability of painting systems specified or where the manufacturer requires removal of all existing paint in order to recommend the use of the specified painting system.

3.2 SURFACE PREPARATION

A. General:
   1. Test for moisture content of surfaces before commencement of painting Work. Test for moisture in concrete in compliance with ASTM D4263. Report results to ENGINEER before commencing the Work.
   2. Perform all preparation and cleaning procedures as specified herein and in strict accordance with paint manufacturer's approved instructions for each particular surface and atmospheric condition.
   3. CONTRACTOR shall remove all hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items already in-place and that do not require field painting, or provide effective surface-applied protection prior to surface preparation and painting operations.
   4. CONTRACTOR shall remove, as necessary, items, which must be field-painted where adjacent surfaces cannot be completely protected from splatter or overspray. Following completion of painting of each space or area, the removed items shall be reinstalled by workers skilled in the trades involved.
   5. Clean surfaces to be painted before applying any painting system components. Remove oil and grease with clean cloths and cleaning solvents prior to mechanical cleaning.
   6. ENGINEER shall be notified of any material that appears improperly shop-painted. A determination on how to proceed will be made with the ENGINEER.

B. Cast-In-Place Concrete:
   1. Prepare surfaces of concrete unit masonry to be painted by removing all efflorescence, chalk, dust, dirt, grease, oils, and other contamination, with soap and water. All surfaces shall be clean and dry at the time of paint system application.
   2. Concrete unit masonry that cannot be adequately cleaned by soap and water shall be acid etched with a commercial solution of 15 percent muriatic acid.

3. Prepare and clean all surfaces of cast-in-place concrete and precast concrete in compliance with ASTM D4259 to obtain a uniform and continuous anchor profile of approximately 1-mil. Provide mechanical abrading procedures and abrasive blasting procedures as specified in ASTM D4259. Use 40 to 80-mesh abrasive and clean, dry, compressed air. Compressed air cleanliness shall be in compliance with ASTM D4285. Pressure at blasting nozzle shall not exceed 80 pounds per square inch. Do not concentrate blast on surface but move at a fairly rapid rate to provide a surface free of laitants and contaminants. Provide post-surface preparation cleaning in accordance with ASTM D4258 to remove loose material. Surface preparation shall open all surface air holes by removing all laitance shoulders surrounding the air holes. Vacuum all surfaces to remove all dust and sand as appropriate.
4. Remove all cast-in-place concrete fins, projections and other surface irregularities, which would protrude above the level of finished intermediate fillers and surfacers by chipping and scarification by mechanical abrasion.
5. Using specified filler and surfacer, patch all cast-in-place concrete and precast concrete surfaces in accordance with manufacturer recommendations.
6. Perform tests in compliance with ASTM D4262 and ASTM D4263 in order to verify the alkalinity and moisture content of the surfaces to be painted and report findings to ENGINEER. If, in the opinion of ENGINEER, the surfaces are sufficiently alkaline to cause blistering and burning of the paint, correct this condition before application of paint. Provide suitable testing materials in order to carry out alkalinity and moisture tests. Do not paint over surfaces where the moisture content exceeds eight percent.
7. Where a concrete unit masonry block filler is specified, spot patch holes and cracks with a putty knife using specified block filler. Apply to large surfaces by airless spray and backroll uniformly using a roller with a synthetic nap cover. Follow with a rubber squeegee to provide a smooth finish.

C. Ferrous Metals:
1. Comply with manufacturer's recommendations for type and size of abrasive in order to provide a surface profile meeting manufacturer's painting system requirements for type, function and location of surface. Verify that manufacturer recommended profiles have been achieved on prepared surfaces. Report profiles to ENGINEER using Test Method C in compliance with ASTM D4417.
2. Clean non-submerged ferrous surfaces including structural steel and miscellaneous metal to be shop-primed, of all oil, grease, dirt, mill scale and all other contamination by commercial blast cleaning complying with SSPC SP 6, at the time of paint system application, using SSPC VIS 1 as a standard of comparison.
3. Clean submerged ferrous surfaces including structural steel and miscellaneous metal to be shop-primed, of all oil, grease, dirt, mill scale and all other contamination by near-white blasting complying with SSPC SP 10, at the time of painting system application, using SSPC VIS 1 as a standard of comparison.

4. Clean non-submerged, ferrous surfaces that have not been shop-coated of all oil, grease, dirt, loose mill scale and all other contamination by commercial blasting complying with SSPC SP 6, at the time of painting system application, using SSPC VIS 1 as a standard of comparison.
5. Clean submerged ferrous surfaces that have not been shop-coated or that have been improperly shop-coated, of all oil, grease, dirt, mill scale and all other contamination by near-white blasting complying with SSPC SP 10, at the time of painting system application, using SSPC VIS 1 as a standard of comparison.
6. Touch-up shop-applied prime coats which have damaged or have bare areas, with primer recommended by manufacturer using industry accepted standards to provide a surface profile of not less than 1-mil.
7. Power tool clean, complying with SSPC SP 3, in order to remove welding splatter and slag.
8. Remove all rust and contamination on existing ferrous metals to sound surfaces by power tool cleaning complying with SSPC SP 11 to provide a surface profile of not less than 1-mil.
9. Cleaning: Tank shall be cleaned to remove sediment and coarse debris, including aluminum or magnesium anode rods, from the tank bottom. Sediment and debris shall be removed and disposed of in accordance with local, state, and federal regulations.

D. Non-Ferrous Metal Surfaces: Prepare all non-ferrous metal surfaces for painting by light whip blasting or by lightly sanding with 60 to 80-mesh sandpaper.

E. Galvanized (Zinc-Coated) Surfaces: Prepare all galvanized surfaces for painting by lightly sanding with 60 to 80-mesh sandpaper or by light whip blasting. All galvanized roof deck shall be brush-blasted per SP7 to remove any passivators and lightly etch the galvanizing on the surface to be painted.

F. PVC and CPVC Piping and Fiberglass: Lightly sand and clean all surfaces to be painted. Fiberglass surfaces shall be prepared by solvent washing to remove wax and other contaminants before abrading surfaces with 60-80-mesh sandpaper to give an anchor pattern providing scratches no further apart than 1/16-inch.

G. Covering on Pipe Insulation:
1. Remove all oil and surface contaminants as recommended by manufacturer for surface and application required.
2. Do not cut or damage the insulation in any way.

3.3 PROTECTION OF PROPERTY AND STRUCTURES

A. Protect property and structures adjacent to Work from waste residues resulting from cleaning, surface preparation and paint application.

B. Use shrouding, vacuum blasting or other approved methods for cleaning and surface preparation of exterior surfaces.

C. During blast cleaning and surface preparation of interior and exterior surfaces, control exhausting of dust and grit, using shrouding, negative-pressure containment/dust collection systems, or other means to protect adjacent property and structures and prevent dust/grit from escaping. Similarly control removal and temporary storage of residues to protect adjacent property and structures.

D. For painting of exterior surfaces, use rollers, shrouding or other approved methods as required to protect adjacent property and structures from wind-blown paint residues.

E. Submit proposed procedures for cleaning, surface preparation and paint application detailing methods to be used to protect adjacent property and structures from residues. Do not proceed with cleaning, surface preparation or painting until proposed procedures are approved by ENGINEER.

3.4 MATERIALS PREPARATION

A. General:
   1. Mix and prepare painting materials in strict accordance with manufacturer's product literature.
   2. Do not mix painting materials produced by different manufacturers, unless otherwise permitted by manufacturer's instructions.
   3. Where thinners are required in the Work, they shall be produced by the paint system manufacturer, unless otherwise permitted by the manufacturer's product literature, submitted to ENGINEER at the time of Shop Drawing approval.

B. Tinting:
   1. Tint each undercoat a lighter shade to facilitate identification of each coat of paint where multiple coats of the same material are to be applied.
   2. Tint undercoats to match the color of the finish coat of paint, but provide sufficient difference in shade of undercoats to distinguish each separate coat. Provide a code number to identify material tinted by the manufacturer.

C. Mixing:
   1. For those products requiring constant agitation use methods in compliance with manufacturer's product literature, to prevent settling during paint application.
   2. Mix only in containers placed in suitably sized non-ferrous or oxide resistant metal pans to protect concrete floors from slashes or spills which could stain exposed concrete or react with subsequent finish floor material.
   3. Mix and apply paint only in containers bearing accurate product name of material being mixed, or applied.

4. Stir all materials before application to produce a mixture of uniform density, and as required during the application of the materials. Do not stir any film, which may form on the surface into the material. Remove the film and, if necessary, strain the material before using.
5. Strain products requiring such mixing procedures. After adjusting mixer speed to break up lumps and after components are thoroughly blended, strain through 35- to 50-mesh screen before application.

3.5 APPLICATION

A. General:
1. Apply paint systems by brush, roller, or airless spray in accordance with manufacturer's recommendations and in compliance with Paint Application Specifications No. 1 in SSPC Volume 2, where applicable. Use brushes best suited for the type of material being applied. Use rollers of carpet, velvet back, or high pile sheep's wool as recommended by manufacturer for material and texture required. Use air spray and airless spray equipment recommended by manufacturer for specific painting systems specified. Submit a list of application methods proposed, listing paint systems and location.
2. Paint dry film thicknesses required are the same regardless of the application method. Succeeding coats shall be applied according to manufacturer's recommendations.
3. Apply additional coats when undercoats, stains, or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance. This is of particular importance regarding intense chroma primary colors. Ensure that all surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a film thickness equivalent to that of flat surfaces.
4. Surfaces of items not normally exposed-to-view do not require the same color as other components of the system of which they are a part, but require the same painting system specified for exposed surfaces of the system.
5. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint before final installation of registers or grilles.
6. Paint the backs of access panels, and removable or hinged covers, to match the exposed surfaces.
7. Paint aluminum parts in contact with dissimilar materials with specified paint system.
8. Paint hollow metal doors on tops, bottoms, and side edges, the same as exterior surfaces.
9. Omit field-applied primer on metal surfaces that have been primed in the shop. Touch-up paint shop-primed coats and pre-finished items only when approved by ENGINEER using compatible primers and manufacturer's recommended compatible field-applied finishes.
10. Welds shall be stripe-coated with intermediate or finish coat of paint after application of prime coat.

B. Minimum/Maximum Paint Film Thickness:
   1. Apply each material at not less than, nor more than, manufacturer's recommended spreading rate, and provide total dry film thickness as specified.
   2. Apply additional coats of paint if required to obtain specified total dry film thickness.
   3. Maximum dry film thickness shall not exceed 100 percent of minimum dry film thickness, except where more stringent limitations are recommended by the paint manufacturer for a specific product.

C. Scheduling Surface Preparation and Painting:
   1. Apply the first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration in consideration of the atmospheric conditions existing at the time of surface preparation and painting. Surfaces that have started to rust before first-coat application is complete shall be brought back to required standard by abrasive blasting.
   2. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure and the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.
   3. Scarify primers and other painting system components by brush-blasting if paint has been exposed for lengths of time or under conditions beyond manufacturer's written recommendations for the painting systems involved, the intended use, or the method of application proposed for subsequent coats of paint.
   4. Schedule cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

D. Prime Coats: Recoat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects caused by insufficient sealing.

E. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage.

F. Brush Application:
   1. Brush-out and work all brush coats onto the surfaces in an even film. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable. Neatly draw all glass and color break lines.
   2. Brush apply all primer or first coats, unless otherwise permitted to use mechanical applicators.

G. Mechanical Applicators:
   1. Use mechanical methods for paint application when permitted by governing ordinances, manufacturer, and approved by ENGINEER.
   2. Limit roller applications, if approved by ENGINEER, to interior wall finishes for second and third coats. Apply each roller coat to provide the equivalent hiding as brush-applied coats.
   3. Wherever spray application is used, apply each coat to provide the equivalent hiding of brush-applied coats. Do not double back with spray equipment for the purpose of building up film thickness of two coats in one pass.

H. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish, or repaint Work not in compliance with specified requirements as required by ENGINEER.

3.6 FIELD QUALITY CONTROL

A. The right is reserved by ENGINEER to invoke the following material testing procedure at any time, a maximum of five times, during the period of field painting:
   1. Unless instructed otherwise by ENGINEER, painting services will continue throughout the testing process.
   2. CONTRACTOR shall engage the service of an independent testing laboratory to sample any of the paints being used, as designated by the ENGINEER. Samples of materials delivered to the Site will be taken, identified and sealed, and certified as to being the material actually applied to the surfaces in each area, in the presence of CONTRACTOR.
   3. A testing laboratory, selected by DEPARTMENT and paid for by the CONTRACTOR, will perform appropriate tests for any or all of the following characteristics:
      a. Abrasion resistance.
      b. Apparent reflectivity.
      c. Flexibility.
      d. Washability.
      e. Absorption.
      f. Accelerated weathering.
      g. Dry opacity.
      h. Accelerated yellowness.
      i. Recoating.
      j. Skinning.
      k. Color retention.
      l. Alkali resistance.
      m. Quantitative materials analysis.
   4. If the test results show that the material being used does not comply with the specified requirements, CONTRACTOR may be directed to stop painting and remove non-complying paint; and prepare and repaint surfaces painted with the rejected paint with material complying with these Specifications.

B. Notify ENGINEER after completion of each coat of paint. After inspection and checking of film thickness, and for other imperfections, and after approval by ENGINEER, proceed with the succeeding coat. Purchase for ENGINEER two new dry-film thickness gages for checking the film thickness and one set of visual standards to check surface preparation. Calibrate dry film thickness gage at the Site using Bureau of Standards standard shim blocks. Provide one holiday detector for holiday testing. The holiday detector will remain the property of CONTRACTOR.

1. Products and Manufacturers: The following equipment shall be provided unless an approved equal is submitted and approved:
   a. Film Thickness Tester: Model FM-III as manufactured by Mikrotest, (Furnish two).
   b. Holiday Detector: Model M-1 as manufactured by Tinker & Rasor.
   c. Visual Standards: ASTM D2200, Swedish Standards, SSPC VIS 1.
2. ENGINEER shall witness all holiday testing and shall be notified of all scheduled testing 24 hours in advance.
3. Additional coats shall be applied, if required, to produce the specified film thickness, to correct holidays, and to completely fill all surface air holes.
4. Holiday testing shall be performed by CONTRACTOR.

C. For magnetic substrates, measure thickness of dry film nonmagnetic coatings following recommendations of SSPC PA 2. These procedures are intended to supplement manufacturers' approved instructions for the manual operation of measurement gages and are not intended to replace them.

D. Record time, location, number of coats, dry film thickness, holidays and other imperfections and submit testing results to ENGINEER.

3.7 PROTECTION

A. Provide "Wet Paint" signs as required to protect newly painted finishes. Remove all temporary protective wrappings provided for protection of this Work and the work of other contractors after completion of painting operations.

3.8 ADJUSTMENT AND CLEAN-UP

A. Correct all damages to the work of other trades by cleaning, repairing or replacing, and repainting, as acceptable to ENGINEER.

B. During the progress of the Work, remove from the Site all discarded paint materials, rubbish, cans and rags at the end of each Work day.

C. Upon completion of painting, clean all paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

D. At the completion of Work of other trades, touch-up and restore all damaged or defaced painted surfaces as determined by ENGINEER.

E. Re-paint surfaces and equipment if damaged during commissioning prior to Substantial Completion.

+ + END OF SECTION + +

SECTION 10 14 00

SIGNAGE

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to furnish and install signage.
      a. CONTRACTOR shall be responsible for all signage furnished under this Section for the entire Project in accordance with the Contract Documents.
      b. Under this Section, each prime CONTRACTOR shall provide signage for their own Contract, in accordance with the Contract Documents.
   2. Extent of signage is shown and specified.
   3. Types of products required include the following:
      a. Room identification, information, entry and directional signs.
      b. Health, safety, warning, floor loading and fire extinguisher location signs.
      c. Stainless steel fasteners, supports, very-high-bond high-performance mounting tape, primers and other accessories.

B. Coordination:
   1. Coordinate adhesives and fasteners with mounting surfaces. Review other Sections to ensure compatibility of signage mounting accessories with various surfaces on which signage will be installed.
   2. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before signage Work.
   3. Notify other contractors in advance of installing signage to provide other contractors with sufficient time for installing items included in their contracts to be installed with or before signage Work.

C. Related Sections:
   1. Section 03 30 00, Cast-in-place Concrete.
   2. Section 09 91 00, Painting.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. AA DSA-45, Designation System for Aluminum Finishes.
   2. ASME A13.1 Scheme for the Identification of Piping Systems.
   3. ANSI/ICC A117.1, Accessible and Usable Buildings and Facilities.
   4. ANSI Z535.1, Marking Physical Hazards Safety Color Code.

5. ANSI Z535.2, Environmental and Facility Safety Signs.
6. ANSI Z535.3, Criteria for Safety Symbols.
7. ASTM B26/B26M, Specification for Aluminum-Alloy Sand Castings.
8. ASTM B584, Specification for Copper Alloy Sand Castings for General Applications.
9. ASTM E527, Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS).
10. CDA, Properties of Cast Copper Alloys.
11. NFPA 704, System for the Identification of the Hazards of Materials for Emergency Response.
12. UL 924, Safety of Emergency Lighting and Power Equipment.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Signage Manufacturers:
      a. Engage firms specializing in producing types of products specified, in compliance with the Contract Documents, with documented record of successful in-service performance, and that possess sufficient production capacity to avoid delaying the Work.
      b. Submit to ENGINEER name and experience record of manufacturers.

B. Component Supply and Compatibility:
   1. Obtain each separate type of signage from a single Supplier and from a single manufacturer.

C. Regulatory Requirements: Comply with applicable requirements of the following:
   1. OSHA, 29 CFR Part 1910.1200, Hazard Communication Standard.
   2. OSHA, 29 CFR Part 1910, Subpart Z, Toxic and Hazardous Substances.
   3. OSHA, 29 CFR Part 1910.144, Safety Color Code for Marking Physical Hazards.
   4. OSHA, 29 CFR Part 1910. 145, Specification for Accident Prevention Signs and Tags.
   5. United States Access Board, Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines.
   6. Americans with Disabilities Act (ADA), Public Law 101-36, 28 CFR Part 36, Appendix A, Accessibility Guidelines for Buildings and Facilities (ADAAG), relative to characters and symbols contrast only.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:

a. Schedule of all signage required for the Work, indicating signage type location, and other information to demonstrate compliance with the Contract Documents.
b. Fabrication and erection information for each type of signage
c. Complete, camera-ready, color graphic layouts of custom-designed signs based on specified requirements and manufacturer recommendations.
d Complete selection of each specified manufacturer's standard and custom graphic layouts and pictograms, colors, and alphabetic/text styles.
e. Mounting and Installation Data:
1) Drawings of and information on anchorages and accessory items.
2) Submit location template drawings for items supported or anchored to permanent construction.
3) Coordinate mounting position, method, and proposed mounting accessories and fasteners with actual Project conditions.

2. Product Data:
a. Copies of manufacturer’s technical data, including catalog information and specifications, for each product specified.

3. Samples:
a. Each color and finish of exposed materials and accessories required for signage.
b. Sample Signage:
1) Full-size Sample of each type of permanent room and space identification sign, and informational and directional sign incorporating all features specified.
2) Full-sized Sample right-to-know signs, labels and tags.
c. ENGINEER's review of Samples will be for color and texture only. Compliance with other requirements is CONTRACTOR's responsibility.

B. Informational Submittals: Submit the following:
1. Manufacturer's Instructions:
a. Templates for anchorages to be installed in concrete or masonry.

C. Closeout Submittals: Submit the following:
1. Warranty Documentation:
a. General and special warranties required under this Section.

D. Maintenance Material Submittals: Submit the following:
1. Extra Stock Materials:
a. Furnish extra stock materials from the same manufactured lot as the materials installed.

b. Submit documentation of actual quantities of signage installed for the Project and calculations indicating the required quantity of extra stock materials.

1.5 WARRANTY

A. General Warranty: The special warranty specified for each type of sign in this Article shall not deprive DEPARTMENT or CITY of other rights or remedies DEPARTMENT or CITY may otherwise have under the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by CONTRACTOR under the Contract Documents. The obligations of CONTRACTOR under the Contract Documents shall not be limited in any way by the provisions of the specified special warranty.

B. Special Warranty on Products:
   1. Provide each signage manufacturer's written warranty, running to the benefit of DEPARTMENT and CITY, agreeing to correct, or at option of DEPARTMENT or CITY, remove or replace materials specified in this Section found to be defective during a period of five years after the date of Substantial Completion.
   2. Special warranty shall cover defective Work that includes, but is not limited to, the following:
      a. Deterioration of metal and polymer finishes beyond normal weathering.
      b. Deterioration of embedded graphic image colors and sign lamination.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. General:
   1. Details shown or indicated for signage, such as alpha-numeric and text type representation, letter spacing, designs of borders, and other graphic features, are generic and intended only to establish text, general positions, and symbols.
   2. Colors shall be brilliant, distinctive shades, matching the safety colors specified in ANSI Z535.1 and OSHA 1910.144.
   3. Permanent rooms and spaces, and directional and informational signage where specified as accessible to people with disabilities, shall comply with ANSI/ICC A117.1 and ADA-ABA Accessibility Guidelines.
   4. Accident prevention signs and tags shall comply with OSHA 1910.145.
   5. Health, safety, and warning signs shall comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, OSHA 1910.144, and 1910.145, unless otherwise shown or indicated. Colors shall be as indicated in Table 1 of ANSI Z535.1.

In addition to text, safety symbol pictograms shall be incorporated into each sign.

2.2 PANEL SIGNS – ROOM IDENTIFICATION, INFORMATION, ENTRY, AND DIRECTIONAL

A. Products and Manufacturers: Provide one of the following:
   1. Graphic Blast MP and FG ADA System and Custom Design ADA Series, by Best Sign Systems, Inc.
   2. Blast Etched Fiberglass and Blast Etched Melamine Signs, by Visigraph Corporation.
   3. Or equal.

B. Panel Signs - Room Identification, Information, Entry, and Directional:
   1. Product Description: Provide unframed signs, surface-etched, 1/32-inch raised tactile lettering and pictograms, sandblasted on an opaque sheet.
   2. Materials:
      a. Interior Signs: Three-ply, self-extinguishing melamine plastic.
      b. Exterior Signs: One-piece fiberglass.
   3. Size and Thickness: 0.125-inch thick; eight inches by eight inches with 1/2-inch radiused corners.
   4. Graphics and Text: White, Standard Helvetica Medium characters and matching arrow type-face; upper and lower case letters, one-inch high capitals and, in addition, Grade 2 Braille alphabet for room designation, directional, entry, and information signs.
   5. Colors and Contrast: Background of signs shall be eggshell, matte, or other non-glare finish. Characters and symbols shall contrast by at least 70 percent with their background as determined by ADA formula in ADAAG Appendix A4.30.5.

2.3 PANEL SIGNS – HEALTH, SAFETY, WARNING, FLOOR LOADING, AND FIRE EXTINGUISHER LOCATION

A. Product Description: Provide rigid fiberglass reinforced plastic signs with fade-resistant embedded graphics.

B. Products and Manufacturers: Provide one of the following:
   1. Graphic Blast Word and Picture Series, by Best Sign Systems, Inc.
   2. Blast Etched Fiberglass Signs, by Visigraph Corporation.
   3. Or equal.

C. General:
   1. Size and Thickness: 0.125-inch thick; 10 inches by 14 inches, unless otherwise shown or indicated.

2. Graphics and Text: Standard Helvetica Medium characters and matching arrow type-face; upper and lower case, one-inch high capitals and, in addition, Grade 2 Braille alphabet message designations and other text.
3. Exposure: As recommended by sign manufacturer for both indoor and outdoor use and with an upper service temperature limit of 190degrees F. Average durability for outdoor use shall be 15 years.

D. Safety Instruction Signs: Standard color of sign background shall be white; panel shall be green with white letters and numbers. Letters and numbers used against white background shall be black.

E. Caution Signs: Standard color of sign background shall be yellow; panel shall be black with yellow letters and numbers.

F. Danger Signs: Standard color of sign background shall be white; panel shall be black with red insert with white letters and numbers. Letters and numbers used against white background shall be black.

G. Warning Signs: Standard color of sign background shall be orange; panel shall be black with orange insert with black letters and numbers. Letters and numbers used against orange background shall be black.

H. No Smoking Signs: Standard color of sign background shall be white. Letters and numbers used against white background shall be red.

I. Biohazard Signs: Standard color of sign background shall be white; panel shall be black with white letters. Sign shall include red international biohazard pictogram on white background.

J. Floor Loading Signs: Standard color of sign background shall be white; panel shall be blue with white letters and numbers. Letters and numbers used against white background shall be black.

K. Fire Extinguisher Location Signs (surface-mounted units only): Standard color of sign background shall be red with white letters and numbers. Each sign shall include international fire extinguisher pictogram and directional arrow indicating location of fire extinguisher.

L. Auxiliary Products:
1. Mounting Brackets: Provide sign manufacturer's standard mounting brackets for installing projected or double-sided signs.

2.4 AUXILIARY MATERIALS

A. Very-High-Bond High-Performance Bonding Tape:

1. Provide all surface-mounted signage with very-high-bond foam tape backing except where specified as requiring mechanical fasteners.
2. Products and Manufacturers: Provide one of the following:
   a. Scotch Brand (Very-High-Bond) 4942 VHB Double Coated Acrylic Foam Tape and No. 94 Acrylic Primer, by 3M Industrial Tape and Specialties Division.
   b. Or equal.
3. Provide a very-high-bonding pressure sensitive joining system consisting of double-coated conformable acrylic foam tape and release liners.
4. Thickness: 0.045-inch.
5. Tape Width: 1.5 inches.
6. Color: Dark gray.
7. Bonding Adhesive: Acrylic; very-high-bond, solvent and shear resistance.
8. Primer: High-performance tape manufacturers recommended acrylic primer.

B. Fasteners: Provide fasteners of non-magnetic stainless steel of size and type required and recommended by the associated individual signage manufacturer.

C. Anchors and Inserts: Provide nonferrous metal or hot-dipped galvanized anchors and inserts. Provide toothed stainless steel or lead expansion bolts for drilled-in-place anchors.

D. Mounting Brackets:
   1. Provide manufacturer's standard mounting brackets for each of the following sign types: hanging, projected, double-sided.
   2. Provide inserts, and mechanical and adhesive anchoring devices as specified in this Article for installation of signage.

2.5 FABRICATION

A. Shop Assembly:
   1. Fabricate and preassemble items in the shop to the greatest extent possible.
   2. Disassemble units only to extent necessary for shipping and handling limitations.
   3. Clearly mark units for reassembly and coordinated installation.

2.6 SOURCE QUALITY CONTROL

A. Fabrication Tolerances:
   1. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within tolerance of plus or minus 1/16-inch measured diagonally across each sign.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine substrates and conditions under which signage will be installed and notify ENGINEER in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. General:
   1. Location:
      a. Install signage and appurtenances at the locations shown or indicated. When locations are not shown or indicated, install signage at locations directed by ENGINEER.
      b. Lightly mark and locate position of each sign. Obtain ENGINEER's acceptance of marked locations before mounting.
   2. Installation – General:
      a. Install signs level, plumb, and at proper height.
      b. Signage shall be securely mounted with concealed, very-high-bond acrylic foam tape, specified adhesives, or mechanical fasteners where specified. Attach signs to surfaces in accordance with sign manufacturer's instructions, unless otherwise shown or indicated.
      c. Provide very-high-bond acrylic foam tape on back of signage using a full perimeter of specified tape. Leave no gaps in tape perimeter at back of signage; peel off second release liner and press onto surfaces.
   3. Repair or replace damaged units.

B. Panel Signs:
   1. Where permanent identification is provided for rooms and spaces, install signs on the wall adjacent to the latch side of the door.
   2. Where there is no wall space on the latch side of the door, including at double leaf doors, install signs on the nearest adjacent wall.
   3. Mounting height shall be in accordance with ADA-ABA Accessibility Guidelines in areas accessible to disabled people. For other areas install signs with five feet from the finished floor to centerline of sign. Mount such signage so that a person may approach within three inches of the sign without encountering protruding objects or, when reading sign, be forced to stand within the swing of a door.

3.3 PROTECTION AND CLEANING

A. After installation, clean soiled signage surfaces in accordance with manufacturer's written instructions.

B. Protect signage from damage until completion of the Work.

+ + END OF SECTION + +

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SECTION 10 43 16

FIRST AID CABINETS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install all first aid equipment Work.
   2. Extent of the first aid equipment is specified.
   3. Types of products required include the following:
      a. First aid station.
      b. Emergency oxygen kit.
      c. Folding pole stretcher and utility blanket kit.
      d. Emergency burn relief station.
      e. Miscellaneous mounting brackets, accessories, fasteners.

1.2 QUALITY ASSURANCE

A. Quality Source Control:
   1. Furnish as complete first aid equipment produced by one manufacturer, including hardware, accessory items, mounting brackets, and fastenings.
   2. Furnish all equipment by one manufacturer unless otherwise accepted by ENGINEER.

B. Reference Standards: Comply with applicable provisions and recommendations unless otherwise shown or specified:
   1. Occupational Safety and Health Act of 1970.

1.3 SUBMITTALS

A. Shop Drawings: Submit for approval manufacturer's detailed data sheets.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Industrial First Aid Kit: Provide the following:
   1. Quantity: 1 unit.
   2. Description: Each unit shall consist of a balanced assortment of first aid supplies adequate to administer first aid for up to 50 people. Provide 24 gage steel,

weatherproof, dustproof, rust resistant case with rounded corners with carrying handle and wall brackets.

3. Product and Manufacturer: Provide the following:
   a. Industrial First Aid Kit Number 50 by Johnson & Johnson Incorporated.
   b. 36 Unit by Figgie International Incorporated, Fire Protection/Safety Group, Scott Aviation Division.
   c. #50 Person Original Safety First Aid Kit by Northern Safety Company, Incorporated.

B. Emergency Oxygen Kit: Provide the following:
   1. Quantity: 1 unit.
   2. Description: Each unit shall consist of two oxygen cylinders, each cylinder containing 100 liters U.S.P. pure oxygen minimum. Provide a push-button regulator gage, oronasal mask and 5 foot-0 inches of tubing; completely assembled; ready for use.
   3. Product and Manufacturer: Provide the following;
      a. Lif-O-Gen Twin-Pac with carrying case by Lif-O-Gen Division of U.S. Divers Company.

C. Folding Pole Stretcher and Utility Blanket First Aid Kit:
   1. Quantity: 1 unit.
   2. Description: Each unit shall consist of a collapsible emergency stretches, 62-inch by 80-inch utility blanket and industrial first aid kit all housed in an anodized aluminum 24-7/8-inch by 40-1/4-inch by 10-inch wall mounted cabinet.
   3. Product and Manufacturer: Provide the following:
      a. Emergency Stretcher/Utility Blanket Kit by Ferno-Washington Incorporated.

D. Emergency Burn Relief Kit: Provide the following:
   1. Quantity: 1 unit.
   2. Description: Each unit shall consist of 6 yards of 4-inch gauze bandage; 24-inch by 72-inch gauze compress and 4 ounce aerosol can of benzocaine. Provide all items contained within a 24 gage steel, waterproof, dustproof, rust-resistant case with rounded corners and hanger brackets for wall mounting.
   3. Product and Manufacturer: Provide the following:
      a. P/N 70495-00 by Figgie International Incorporated, Fire Protection/Safety Group, Scott Aviation Division.

PART 3 - EXECUTION

3.1 INSPECTION

A. CONTRACTOR shall examine the substrates and conditions under which the first aid equipment Work is to be installed and notify ENGINEER in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with

the Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

3.2 INSTALLATION

A. Install first aid equipment as specified and in accordance with the manufacturer's instructions. Position units plumb and true, securely anchored in place with proper clips, brackets and bolts for the type of mounting required. Location as directed by ENGINEER.

++ END OF SECTION ++

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SECTION 10 44 00

FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install all fire protection specialties Work.
   2. Extent of fire protection specialties Work is shown and specified.
   3. Types of fire protection specialties Work required includes:
      a. Dry chemical extinguishers.
      b. Carbon dioxide extinguishers.
      c. Mounting accessories and miscellaneous fasteners.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate installation of items that must be installed with or before fire protection specialties.

C. Related Sections:
   1. Section 10 14 00, Signage.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ASTM E814, Test Method for Fire Tests of Penetration Fire Systems
   2. FM Global, FM Approval Guide.
   3. NFPA 10, Portable Fire Extinguishers.
   4. UL Fire Classification Rating.
   5. U.S. Architectural & Transportation Barriers Compliance Board's Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities.

1.3 QUALITY ASSURANCE

A. Component Supply and Compatibility:
   1. Provide fire protection specialties products from one manufacturer.

B. Certifications: 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. Provide fire extinguishers approved, listed, and labeled to comply with ASTM E814.

C. Regulatory Requirements:
1. Provide fire protection specialties approved and labeled by UL.
2. Provide fire protection specialties conforming to NFPA 10 requirements.
3. Provide fire protection specialties conforming to ADA-ABA Accessibility Guidelines.

1.4 SUBMITTALS

A. Action Submittals:
1. Product Data: Submit the following:
a. Manufacturer's technical data, certification of UL rating, and installation instructions for fire protection specialties.
b. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
c. Product Schedule: For fire extinguishers and fire protection cabinets. Coordinate final fire extinguisher and fire protection cabinet schedule to ensure proper fit and function.

B. Closeout Submittals: Submit the following:
1. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.
2. Warranty: Sample of special warranty.

1.5 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

1.6 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.
b. Faulty operation of valves or release levers.
2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. General: Provide manufacturer's standard mounting brackets for portable fire extinguishers size as specified.

B. Multi-Purpose Dry Chemical Fire Extinguishers (FE "A"):
   1. Ten-pound capacity, enameled steel container with pressure-indicating gauge, for Class A, Class B, Class C fires, UL rating 4A-60 B:C.
   2. Products and Manufacturers: Provide one of the following:
      a. Cosmic Model 10E by J.L. Industries, a division of Activar Inc. Construction Products Group.
      b. Or equal.

C. Carbon Dioxide Fire Extinguishers (FE "B"):
   1. Ten-pound enameled steel container capacity, for Class B and Class C fires, UL rating 10 B:C.
   2. Products and Manufacturers: Provide one of the following:
      a. Sentinel Model 10 by J.L. Industries, a division of Activar Inc. Construction Products Group.
      b. Or equal.

D. Identification: Refer to Section 10 14 00, Signage.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine substrates and conditions under which fire protection specialties will be installed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with Work until unsatisfactory conditions have been corrected in manner acceptable to ENGINEER.

3.2 INSTALLATION OF FIRE EXTINGUISHERS

A. When exact locations of fire protection specialties are not shown on Drawings, locate as directed by ENGINEER.

B. Securely fasten products to structure, square and plumb, in accordance with Supplier's instructions. Mounting heights shall be:
   1. Install fire extinguishers to meet ADA/ABA requirements.
   2. Install fire extinguishers with gross weight greater than 40 pounds with top of fire extinguisher no more than 3.5 feet above finished floor.
   3. Install fire extinguishers with gross weight less than 40 pounds with top of fire

extinguisher no more than 4.0 feet above finished floor.

4. Clearance between bottom of fire extinguisher and finished floor shall be at least four inches.

C. Identification Devices: Refer to Section 10 14 00, Signage.

D. Recharge fire extinguishers provided under this Contract so that most recent inspection date coincides as nearly as possible with date of Substantial Completion. Inform OWNER in writing of next required inspection and recharging date.

3.3 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.

E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

3.4 FIRE EXTINGUISHER SCHEDULE

A. FE “A” – Multi-Purpose Dry Chemical Fire Extinguisher, wall mounted.

B. FE “B” – Carbon Dioxide Fire Extinguisher, wall mounted.

+ + END OF SECTION + +

SECTION 11 13 00

LOADING DOCK EQUIPMENT

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install all loading dock equipment.
   2. Extent of loading dock equipment is shown.
   3. Types of products required include the following:
      a. Dock Bumpers.
      b. Miscellaneous anchors, fasteners, and other accessories.

B. Coordination:
   1. Coordinate installation of anchorages for loading dock equipment. 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. Deliver such items to Project site in time for installation.

C. Related Sections:
   1. Section 03 30 00, Cast-in-place Concrete.
   2. Section 13 34 19, Metal Building Systems.

1.3 QUALITY ASSURANCE

A. The requirements for the equipment in this Section shall constitute the acceptable minimum standards for the equipment specified herein. Should these requirements conflict with the manufacturer's recommendations or in any way be less stringent than the manufacturer's requirements, the CONTRACTOR shall promptly notify the ENGINEER in writing of the conflict and the more stringent standards shall supercede the DEPARTMENT's requirements.

B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

C. Source Limitations: Obtain each type of loading dock equipment through one source from a single manufacturer.

1.4 SUBMITTALS

A. Shop drawings, specifications, brochures, calculations, maintenance data, warranties and samples shall be submitted and shall include but not limited to the following:
   1. Shop Drawings, including all equipment and components.
   2. Brochures and/or Catalog Cuts.
   3. Performance characteristics.

B. Product Data: Include construction details, material descriptions, accessories, dimensions of individual components and profiles, and finishes.

C. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, details, and attachments to other work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Provide transportation, handling, storage and protection of all materials and equipment in accordance with the Contract Documents.

1.6 PROJECT CONDITIONS

A. Field Measurements: Indicate measurements on Shop Drawings.
   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish slopes of driveways, and heights of loading docks and proceed with fabricating loading dock equipment without field measurements. Coordinate loading dock construction to ensure that actual dimensions correspond to established dimensions.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM 36/A 36M.
B. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from steel plate complying with ASTM A 572/A 572M, Grade 55 (380).
C. Steel Tubing: ASTM A 500, cold formed.
D. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.2 DOCK BUMPERS

A. Construction:
   1. Resilient rubber bumper material cut from recycled truck tires in the sizes shown. Pads punched to receive ¾-inch supporting rods.

2. Bumpers are closed with two 3-inch x 3-inch x 1/4-inch structural angles under 1,500 lbs. of pressure. The angles are welded to 3/4-inch rods at one enclosed with the rod being threaded at the opposite end, using a nut rod and angle in place. End angles have two 13/16-inch stainless steel anchor bolts.
3. Standard finish: Hot dipped galvanized.
4. Size: 10-inches high x 36-inches long x 4 1/2-inches thick.
5. Product and Manufacturer: Furnish one of the following:
   a. B4510-36 by Durable Corporation.
   b. Dock bumpers by Blue Giant Equipment Corporation.
   c. Or equal.

2.3 FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine the substrate and conditions under which loading dock equipment is to be installed and notify ENGINEER in writing of any conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

B. Verify that field measurement areas shown on the approved submittal drawings and/or manufacturer's instructions. Notify the ENGINEER immediately in writing of any deviations.

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

3.2 INSTALLATION, GENERAL

A. Install loading dock equipment, as required for a complete installation, in accordance with manufacturers written instructions.

3.3 ADJUSTING AND CLEANING

A. Adjust loading dock equipment for proper, safe, efficient operation.

B. Restore marred, abraded surfaces to their original condition.

+ + END OF SECTION + +

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SECTION 13 34 19

METAL BUILDING SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, tools, equipment and incidentals as shown, specified and required to design, furnish and install all metal building systems. The Work also includes:
      a. Building into metal building systems required items and providing openings, closures and escutcheons for metal building systems to accommodate the Work under this and other Sections and attaching to the metal building systems all items such as sleeves, hoods, supports, fasteners and all items required, for which provision is not specifically included under other Sections.
      b. Building into the metal building systems required items and providing openings, closures and escutcheons for metal building systems to accommodate the Work under other contracts and attaching to the metal building systems all items required, for which provision is not specifically included under other contracts.
   2. Extent of metal building systems is shown.
   3. Types of products required include the following:
      a. Multi-bay clear span structural system of low rigid frame type, gable.
      b. Metal roof panel system.
      c. Metal wall panel system.
      d. Insulated double walled metal wall panel system.
      e. Metal liner panels.
      f. Glass-fiber blanket roof insulation.
      g. Doors, hardware and trim.
      h. All auxiliary system components, flashing closures, base moldings, gutters, downspouts, vapor retarders, service-way panels and all other items not specified under this or other Sections, but required to provide a completely watertight and functioning building.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with, or before, the metal building systems.
   2. Notify other contractors in advance of the installation of the metal building systems to provide them with sufficient time for the

installation of items that must be installed with, or before, the metal building systems.

3. Coordinate the locations of equipment, piping, heating and ventilating ductwork, electrical conduit and similar items in order to provide required clearances and supports for such items without modification of metal building system components at the Site.

C. Related Sections:
1. Section 01 42 00, References.
2. Section 03 00 05, Concrete.
3. Section 07 21 05, Building Insulation.
4. Section 07 92 00, Joint Sealants.
5. Section 08 11 13, Hollow Metal Doors and Frames.
6. Section 08 71 00, Door Hardware.
7. Section 08 81 00, Glass Glazing.
8. Section 08 95 01, Translucent Wall Panel Systems.
9. Section 09 61 53, Concrete Hardener.
10. Section 09 91 00, Painting.
11. Section 26 05 26, Grounding and Bonding For Electrical Systems.

1.2 REFERENCE STANDARDS

A. Comply with the applicable provisions and recommendations of the following, except as otherwise shown and specified:
1. AAMA/WDMA/CSA 101/I. S.2/A 440, Standard/Specification for Windows, Doors, and Unit Skylights.
2. AAMA 701/702, "Combined Voluntary Specification for Pile Weatherstripping and Voluntary Specification for Replacement Fenestration Weatherseals"
3. AISC, AISC 303, Code of Standard Practice for Steel Buildings and Bridges.
4. AISC, AISC 360, Specification for Structural Steel Buildings.
5. AISI, AISI S100, North American Specification for the Design of Cold-Formed Steel Structural Members.
6. AISI, AISI SG-911, Load and Resistance Factor Design Specification for Steel Structural Members.
7. Architectural Metal Products Division of NAAMM, Metal Finishes Manual for Architectural and Metal Products.
8. ASCE 7, Minimum Design Loads for Buildings and Other Structures.
9. ASTM A36, Specification for Carbon Structural Steel.
10. ASTM A53, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
11. ASTM A153, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

12. ASTM A307, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
13. ASTM A325, Specification for High-Strength Bolts for Structural Steel Joints.
14. ASTM A366, Specification for Commercial Steel (CS) Sheet, Carbon, (0.15 Maximum Percent) Cold-Rolled.
15. ASTM A463, Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process,
16. ASTM A475, Specification for Zinc-Coated Steel Wire Strand.
17. ASTM A490, Specification for Heat-Treated Steel Structural Bolts, 150ksi Minimum Tensile Strength.
18. ASTM A500, Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
19. ASTM A501, Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
20. ASTM A529, Specification for High-Strength Carbon-Manganese Steel of Structural Quality.
21. ASTM A653 / A653M - 09 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
22. ASTM A568, Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.
23. ASTM A569, Specification for Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip Commercial Quality.
24. ASTM A570, Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality.
25. ASTM A572, Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
26. ASTM A611, Specification for Structural Steel (SS), Sheet, Carbon, Cold-Rolled.
27. ASTM A653, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
28. ASTM A755, Specification for Sheet Steel, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
29. ASTM A792, Specification for Sheet Steel, 55 Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
30. ASTM A992, Specification for Structural steel Shapes.
31. ASTM B221 - 08 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
32. ASTM B695, Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
33. ASTM C423, Test Method for Sound Absorption and Sound

Absorption Coefficients by the Reverberation Room Method.

34. ASTM C920, Specification for Elastomeric Joint Sealants.
35. ASTM C991, Specification for Flexible Glass Fiber Insulation for Pre-Engineered Metal Buildings.
36. ASTM C1107, Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
37. ASTM C1136, Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
38. ASTM D523, Test Method for Specular Gloss.
39. ASTM D1494, Specification for Diffuse Light Transmission Factor of Reinforced Plastics Panels.
40. ASTM D3841, Specification for Glass-Fiber-Reinforced Polyester Plastic Panels.
41. ASTM D4214, Test Method for Evaluating Degree of Chalking of Exterior Paint Films.
42. ASTM E84, Test Method for Surface Burning Characteristics of Building Materials.
43. ASTM E94, Guide for Radiographic Examination.
44. ASTM E96, Test Methods for Water Vapor Transmission of Materials.
45. ASTM E119, Test Methods for Fire Tests of Building Construction and Materials.
46. ASTM E136, Test Method for Behavior of Materials in a Vertical Tube Furnace at 750^0 C.,
47. ASTM E142, Method for Controlling Quality of Radiographic Testing.
48. ASTM E164, Practice for Ultrasonic Contact Examination of Weldments.
49. ASTM E165, Test Method for Liquid Penetrant Examination.
50. ASTM E283, Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
51. ASTM E329, Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.
52. ASTM E331, Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
53. ASTM E548, Guide for General Criteria Used for Evaluating Laboratory Competence.
54. ASTM E709, Guide for Magnetic Particle Examination.
55. ASTM E1646, Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.
56. ASTM E1680, Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems.
57. ASTM E1980, Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.
58. ASTM E2190, Specification for Insulating Glass Unit Performance and Evaluation.

59. ASTM F959, Specification for Compressible-Washer Type Direct Tension Indicators for Use with Structural Fasteners.
60. AWS, D1.1, Structural Welding Code - Steel.
61. AWS, D1.3, Structural Welding Code - Sheet Steel.
62. BMHA Standards.
63. 16 CFR 1201, Safety Standard for Architectural Glazing Materials.
64. FEMA 320 and 361, Rated Tornado and Hurricane Storm Shelter Doors.
65. FM Global, FM 1-7, Wind Forces on Buildings and Other Structures.
66. MBMA, Metal Building Systems Manual, 2012 Edition.
67. NFPA 80, Standard for Fire Doors and Fire Windows.
68. NFPA 105, Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives.
69. NFPA 252, Standard Methods of Fire Tests of Door Assemblies.
70. NFPA 257, Standard on Fire Test for Window and Glass Block Assemblies.
71. RCSC, Specification for Structural Joints Using ASTM A325 and ASTM A490 Bolts.
72. SDI 122, Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
73. SJI, Standard Specifications and Load Tables.
74. SMACNA, Architectural Sheet Metal Manual.
75. SSPC, Steel Structures Painting Manual Vol. 2.
76. U.L. Standard for Safety - UL 580, Tests for Uplift Resistance of Roof Assemblies.

1.3 DEFINITIONS

A. Terminology used in this Specification shall comply with MBMA's, "Low Rise Building Systems Manual" for definitions of terms for metal building systems construction.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. AISC Certification for Category MB: Manufacturer shall be a member of MBMA and be certified by AISC as a manufacturer that designs and produces metal building systems in an AISC-Certified Facility.
   2. Engage a registered professional ENGINEER legally qualified to practice in the jurisdiction where the Project is located and experienced in providing engineering services of the kind indicated, including preparation of shop drawings and comprehensive design analysis.

B. Erector Qualifications:

1. Engage a single erector skilled, trained and with documented experience in the installation of metal building systems, who is acceptable to the metal building system manufacturer, and with specific skill and successful experience in the erection of the types of components required.

C. Testing Agency Qualifications: Qualified, in accordance with ASTM E329, for testing indicated

D. Source Quality Control:
   1. Obtain all metal building system components, both primary and secondary components, through a single source and from a single manufacturer.
   2. Welding:
      a. Qualify procedures and personnel according to AWS D1.1 and AWS D1.3.
      b. Provide certification that all welders employed on the fabrication of the metal building systems have satisfactorily passed AWS qualification tests within the previous twelve months. Manufacturer shall ensure that all certifications are kept current.
   3. Structural Steel: Comply with AISC 360 for design requirements and allowable stresses.
   4. Cold-Formed Steel: Comply with AISI S100 and AISI SG911, for design requirements and allowable stresses.

E. Special Inspections:
   1. DEPARTMENT will employ a Coordinating Special Inspector, who will direct an independent testing agency, hired by the CONTRACTOR, to perform source quality control testing and special inspections, and to prepare test reports.
      a. Testing agency will conduct tests at the direction of the Special Inspector, who interprets tests and state in each report whether test specimens comply with or deviate from requirements.
      b. Allow Coordinating Special Inspector access to places where structural framing is being fabricated or produced. Cooperate with Special Inspector and provide samples of materials as may be requested for additional testing and evaluation.
   2. Correct deficiencies in, or remove and replace structural framing that inspections and test reports indicate do not comply with requirements.
   3. Additional testing, at CONTRACTOR's expense, will be performed to determine compliance of corrected Work with requirements.

F. Regulatory Requirements:
   1. Fabricate and label structural framing to comply with special inspection requirements at point of fabrication for welding and other

connections required by governing authorities having jurisdiction at the Site.

G. Mock-Ups:
1. Before installing wall panels, build mock-ups for each required form of construction and finish to verify selections made under sample submittals and to demonstrate aesthetic effects and qualities of materials and execution.
2. Build mock-ups of the types and of the sizes shown.
   a. Include wall panel assembly with Translucent Panel System, opening framed with metal trim, and insulation with vapor retarder.
   b. Include all sealants at perimeter of Translucent Panel System and joints of wall.
3. Incorporate materials and methods of fabrication and installation that are identical with Project requirements.
4. Obtain ENGINEER's acceptance of visual qualities, color, erection tolerances and workmanship demonstrated on the mock-ups before start of metal building system Work. Retain and protect mock-ups during construction as a standard for judging completed metal building system Work. Do not alter mock-up after approval by ENGINEER.
5. Build as many mock-ups as necessary to achieve ENGINEER's acceptance of the metal building systems. Disassemble rejected mock-ups and remove all components from Site. Do not incorporate rejected mock-up components into the Work. Accepted mock-ups may be incorporated into the finished Work.
6. Metal building systems that do not meet the standard of workmanship approved on the approved sample areas shall be removed and replaced with new material.

H. Pre-installation Conference:
1. Prior to erection of metal building system components and associated Work, CONTRACTOR shall schedule and meet at the Site with the metal building system erector, the installer of each component of associated Work, the installers of substrate construction to receive the metal building systems Work, the installers of other Work in and around metal building system that follows the metal building system Work, including mechanical Work, ENGINEER and other representatives directly concerned with performance of the Work. Review foreseeable methods and procedures related to the metal building system Work, including but not necessarily limited to, the following:
   a. Review Project requirements and the Contract Documents.
   b. Review required submittals, both completed and yet to be completed.
   c. Review status of mock-ups.

d. Review status of foundation work, including approval of surface preparations, structural loading limitations and similar considerations.
e. Review construction schedule and availability of materials, tradesmen, equipment and facilities needed to make progress and avoid delays.
f. Review environmental conditions, other Project conditions, and procedures for coping with unfavorable conditions.
g. Review regulations concerning code compliance, environmental protection, health, safety, fire and similar considerations.
h. Review procedures needed for protection of metal building systems during the remainder of the construction period.
i. Review availability of materials, tradesmen, equipment and facilities needed to make progress and avoid delays.
j. Review required inspections, testing, and certifying procedures, including Special Inspections, if required.

2. Record the discussions of the conference and the decisions and agreements or disagreements reached, and furnish a copy of the record to each party attending.
3. Record all revisions or changes agreed upon, reasons therefore, and parties agreeing or disagreeing with them.
4. Reconvene the meeting at the earliest opportunity if additional information must be developed in order to conclude the subjects under consideration.

1.5 SUBMITTALS

A. Action Submittals: Submit the following:
1. Shop Drawings:
a. Completely dimensioned plans, elevations and cross-sections of the metal building system completely coordinated with all required equipment and building service clearances. Accurately locate, show and dimension the following:
1) Structural framing system including the center lines of the bottom of all columns. Show complete fabrication of primary and secondary framing. Show the location, size, and connection details for diagonal bracing for walls and roof. Indicate welds and bolted connections, distinguishing between shop and Site applications. Include transverse cross-sections.
2) Complete erection drawings showing locations of sidewall, endwall, and roof framing, covering and trim details, and accessory installation details to clearly indicate the proper assembly of building components. Include plans, elevations, details, and attachments to other Work.

3) Show layouts of wall, roof and liner panels on support framing, details of edge conditions, joints, panel profiles, corners, custom profiles, supports, anchorages, trim, flashings, closures, and special details. Distinguish between factory and site assembled Work.
4) Insulations.
5) Vapor-retarders.
6) Trim and closures.
7) Furnish schedule of doors and frames including finish hardware sets, using the same reference numbers as shown. Include details of reinforcement and installation requirements for finish hardware.
8) Translucent Panel System.
9) All required wall and roof penetrations.
10) All roof mounted equipment and curbs, service-way walkways and flashings.
11) Auxiliary and accessory components. Include details of ventilators, gutters and downspouts, and similar auxiliary and accessory system components.
12) All details shall be drawn at a scale of not less than 1-1/2 inches equal to 12 inches.

b. Foundations Loads and Anchor-Bolt Plans:
1) Drawing showing all vertical and horizontal reactions on foundations. Include direction and location of each load application.
2) Include location, diameter, and projection of anchor bolts required to attach metal building to foundation. Indicate column reactions at each location.

2. Product Data:
a. Manufacturer's complete product information, specifications and installation instructions for metal building components and accessories. Include material descriptions, dimensions and profiles of individual system components.

3. Delegated Design Submittals:
a. Hard copy print-outs of structural analysis calculations required to show compliance with loading requirements, deflection requirements, other anticipated movements in the metal building system, and other system performance criteria specified prepared, signed and stamped with the seal of a registered professional ENGINEER, as specified. All calculations and assumptions shall be presented so that ENGINEER can easily follow the progress and logic of registered professional's structural analysis.

4. Samples:
a. Manufacturer's full selection of standard and custom colors showing the full range of colors available for each type of product included in

the metal building system that incorporates a factory-applied color finish, for initial selection by ENGINEER.

b. 12-inch long by actual width of roof and wall panels, with required finishes. Include all auxiliary system components such as clips, caps, battens, fasteners, closures, and other exposed panel accessories.

c. 6-inch square sample of vapor-retarders.

d. Each fastener proposed for use in erection of metal building system, tagged as to location and use in the Work.

e. ENGINEER's review will be for color and profile, only. Compliance with all other requirements is the responsibility of CONTRACTOR.

B. Informational Submittals: Submit the following:

1. Certificates.

a. Letter of Design Certification: Registered professional ENGINEER who prepares, signs and stamps its seal shall provide a written statement confirming responsibility for the design and attesting that the design prepared meets the performance criteria required by the Contract Documents, the requirements of governing authorities having jurisdiction at the Site, and conforms to prevailing standards of practice. Include the following:

1) Name and location of Project.

2) Order number.

3) Name of manufacturer.

4) Name of CONTRACTOR.

5) Building dimensions, including width, length, height, and roof slope.

6) Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.

7) Governing building code and year of edition.

8) Design Loads: Include dead load, roof live load, collateral loads, impact loads, roof snow load, deflection, wind loads/speeds and exposure, design spectral response accelerations at short and 1-second periods (S_{DS} & S_{D1}), seismic importance factor (I), response modification factor (R), seismic response coefficient (C_s), and auxiliary loads, such as loading superimposed on the system by erection equipment.

9) Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing authorities having jurisdiction.

10) Building-Use Category: Indicate category of building use and its effect on load importance factors.

11) AISC Certification for Category MB: Include statement that metal building system and components were designed and produced in an AISC-Certified Facility by an AISC-Certified Manufacturer.

12) Certification of construction for hurricane-resistant and tornado-resistant doors and frames.
13) Manufacturer Certificates: For each product.
14) Erector Certificates: For each product.
15) Welding Certificates: Copies of certificates for welding procedures and personnel, as specified.

2. Test and Evaluation Reports:
   a. Material Test Reports: From a qualified testing agency indicating and interpreting test results of steel for compliance with requirements specified.
   b. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, indicating the following current products comply with requirements:
      1) Insulation and Vapor-Retarders: Include reports for thermal resistance, fire-test-response characteristics, water-vapor transmission, and water absorption.
3. Supplier Instructions:
   a. Installation data
   b. Instructions for handling, start-up, and troubleshooting.
4. Site Quality Control Submittals:
   a. Special Inspections Reports: Coordinate with the Coordinating Special Inspector.
5. Qualifications Statements:
   a. Manufacturer.
   b Erector.
   c Professional Engineer.
   d. Test Agency.

C. Closeout Submittals: Submit the following:
   1. Warranty Documentation:
      a. For metal panel finishes.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver components, sheets, 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 to 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.

1.7 PROJECT CONDITIONS

A. Environmental Conditions:
   1. Weather Limitations: Proceed with erection only when weather conditions permit roof and wall panel installation to be performed according to manufacturer's written instructions and warranty requirements.

B. Site-Measurements:
   1. Verify dimensions in areas of erection by taking measurements at the Site before fabrication. Indicate dimensions on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delay.
   2. Where Site-measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating components without Site-measurements. Coordinate supports, adjacent construction, equipment and locations of openings to ensure actual dimensions correspond to dimensions established for metal building system Work.

1.8 SCHEDULING

1. Schedule the arrival of metal building system components, auxiliary items and accessories to minimize the time they are stored at the Site before erection.
2. Do not proceed with the erection of metal building systems until CONTRACTOR can provide finished Work complying with all requirements of the Specifications.
3. Where metal building systems require the building-in of plates, inserts, anchors and other items, furnish required inserts to avoid delay in the Work of other trades. Provide setting drawings, templates, and directions for installation of plates, inserts and anchors, required by the Work of this Section but installed under other Sections.
4. Coordinate with other Work by furnishing Shop Drawings, inserts and similar items at the appropriate times for proper sequencing of construction without delays.
5. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.9 WARRANTY

A. General Warranty: The special warranties specified in this Article shall not deprive DEPARTMENT or CITY of other rights or remedies DEPARTMENT or CITY may otherwise have under the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by CONTRACTOR under the Contract Documents.

B. Special Warranties:
   1. Panel Coating Wear Warranty: Furnish a written warranty, signed by the manufacturer and running to benefit of DEPARTMENT and CITY, agreeing to replace, for a period of 20 years from the date of Substantial Completion, wall, roof and auxiliary system components and accessories finish that shows excessive wear, as specified, and stating that the coil and spray coated polyvinylidene fluoride based coating specified complies with the following:
      a. Coating will not blister, peel, flake, check nor chip; and shall also be warranted against excessive color change, chalking and cracking, spalling, crazing, or from otherwise losing adhesion for a period of twenty years from the date of installation, to the extent that such shall create unsightly conditions, impair the intended architectural qualities of the building or otherwise fail to meet performance criteria specified, when viewed from a distance of 5 feet from the item.
      b. In the event that the coil coated polyvinylidene fluoride based coating fails to meet the specified standards the manufacturer shall, at his own expense, replace or field paint, at the discretion of DEPARTMENT or CITY, all areas affected by the failure. In the event that repainting is selected, it shall be done at mutually agreeable intervals throughout the term of the warranty.
      c. The warranty does not apply where any failure is caused by accidents, or any external conditions or forces beyond the control of the manufacturer.
   2. Aluminum-zinc Coating Roof and Wall Panel Warranty: Furnish a written warranty, signed by the manufacturer and running to benefit of DEPARTMENT and CITY, agreeing to replace, for a period of 25 years from the date of Substantial Completion, wall, roof and auxiliary system components and accessories finish that shows excessive wear, as specified.
   3. Material and Workmanship Warranty: Furnish a written warranty, signed by the manufacturer and running to benefit of DEPARTMENT and CITY, agreeing to replace metal building system components that fail in material or workmanship within three years of the date of Substantial Completion. Failure of materials or workmanship shall include, but is not limited to, leakage or air infiltration, deflections, or

deterioration of metal in excess of normal weathering, and in excess of performance criteria specified; and defects in, and improper arrangement of, the various parts, accessories, weatherstripping, and other components of the system.

4. Roof Panel Weathertightness: Furnish a limited written warranty on material and workmanship, secured by a recognized surety company and executed by an authorized representative of the manufacturer, running to the benefit of DEPARTMENT and CITY, agreeing to replace, for a period of 20 years from the date of Substantial Completion, standing seam metal roof panel assemblies and flashing that fail to remain water and weather-tight. CONTRACTOR shall obtain all approvals and inspections as may be required by the manufacturer for warranty coverage.

1.10 MAINTENANCE

A. Extra Materials:
   1. Furnish extra materials from the same manufactured lot as the materials installed.
   2. Provide a minimum of five percent excess over the required amount of metal wall panels, metal roof panels, roof insulation, gutters, downspouts, metal trim, flashing, nuts, bolts, screws, washers, and other required fasteners for building. Pack in cartons and store on the site where directed.

B. Do not provide partial containers or packages of materials. Round-up quantities to furnish only complete, unopened and undamaged containers and packages; with legible labels accurately representing contents of container or package indicating compliance with approved Samples and Shop Drawings, and matching materials actually installed.
   1. Submit quantities of each system component required for the Work, based on actual purchase order to manufacturer for materials to be used for this Project, with calculations establishing quantity of extra materials to be furnished to CITY.

C. Do not furnish materials whose remaining shelf-life will be less than six months, at the time of Substantial Completion. Furnish only materials that are accompanied by a documented record of proof of being continuously stored and handled according to manufacturer's recommended storage and temperature limitations.

PART 2 - PRODUCTS

2.1 DESIGN REQUIREMENTS

A. System Description:
   1. Metal building systems include complete, integrated sets of mutually dependent components and assemblies, capable of withstanding structural and other loadings, thermally induced movements, and exposure to weather in the area of the Site, without failure or infiltration of water into the building interior. The system includes primary and secondary framing, roof and wall panels, auxiliary system components and all associated trim, complying with requirements shown and specified, all requirements of the metal building systems manufacturer, and governing authorities having jurisdiction at the Site.

B. Performance Criteria:
   1. General:
      a. Standards: Comply with applicable standards, recommendations and specified publications of MBMA, AISC, ASCE 7 and FM 1-7, except to the extent more stringent requirements are specified or required by governing authorities having jurisdiction at the Site.
      b. Modifications: The metal building system requirements shown are based on the specific system shown. Other manufacturer's systems with equal performance characteristics may be considered. Within these limitations CONTRACTOR shall be responsible for the structural adequacy, detailing and fabrication of the entire metal building system, including anchorage, and to make whatever modifications of, and additions to, the details as may be required to fulfill the performance requirements as acceptable to ENGINEER. Maintain the visual design concept as shown, including member sizes, profiles, support locations and alignment of components, as judged solely by ENGINEER. Clearly identify, in a manner that is highlighted to ENGINEER, all proposed substitutions, modifications, variations, unspecified features and "or equal" products. Provide complete comparative data, with specified products, at time of Shop Drawing submission.
      c. Professional ENGINEER, to whom design of the metal building system is delegated, shall prepare written requests for clarification of system performance criteria and for clarification of other requirements of the Contract Documents for CONTRACTOR to submit to ENGINEER.
   2. Metal Building System Design: Provide size, spacing, and spans shown, and as follows:
      a. Primary Frame Type: Provide the following:

1) Rigid Clear Span: Solid-member structural framing system without interior columns, gable.

b. End-Wall Framing: Manufacturer's standard, for buildings not required to be expandable, as follows:
   1) Provide primary frame, capable of supporting one-half of a bay design load, and end-wall columns.

c. Secondary Frame Type: Manufacturer's standard purlins and girts.

d. Lateral Bracing: Rods.

e. Eave Height: As shown.

f. Bay Spacing: As shown.

g. Roof Slope: As shown.

h. Roof System: Manufacturer's standard standing-seam roof panels, with insulation, field-installed.

i. Exterior Wall System:
   1) Manufacturer's factory-assembled double walled insulated metal wall panels, field-installed.

j. Fire-Resistance: Provide roof and wall panel assemblies with fire-resistance ratings shown.

k. Structural Performance: Provide metal building systems capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1) Design Loads: As shown.

l. Deflection Limits: Design component assemblies to withstand design loads with deflections no greater than the following:
   1) Purlins and Rafters: Vertical deflection of L/240 of the span.
   2) Girts: Horizontal deflection of L/120 of the span.
   3) Roof Panels: Vertical deflection L/150 of the span.
   4) Wall Panels: Horizontal deflection of L/120 of the span.

m. Drift: Lateral deflection of the building frame at the roof line in relationship to the position of the floor or slab-on-grade shall be limited to metal building system manufacturer’s maximum for type of warrantied construction specified, or not greater than allowed by MBMA, whichever is less.

n. Design secondary framing system to accommodate deflection of primary structure, construction tolerances, and to maintain clearances at openings.

o. Seismic Performance: Provide metal building systems capable of withstanding the effects of seismic forces determined in accordance with the governing codes using seismic design factors shown on the Drawings.

p. Thermal Movements: Provide metal building roof and wall panel systems designed for thermal movements. Employ detailing and fabrication techniques that prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects resulting from the

following maximum change (range) in ambient and surface temperatures. Base design calculation on surface temperatures of materials caused by both solar heat gain and nighttime-sky heat loss.

1) Temperature Change (Range): 120 degrees F, ambient; 180 degrees F, material surfaces.

q. Thermal Performance: Provide metal building roof and wall assemblies with the following thermal-resistance values (R-value):

1) Roof Assemblies: R-19 + R-11 with R-5 thermal blocks.
2) Wall Assemblies: R = 19.

r. Air Infiltration:

1) Roof Panels: Provide roof panel assemblies with permanent resistance to air leakage through assembly of not more than 0.09 cfm/sq. ft. of fixed roof area when tested according to ASTM E1680 at a static-air-pressure difference of 4 lbf/sq. ft.
2) Wall Panels: Provide wall panel assemblies with permanent resistance to air leakage through assembly of not more than 0.09 cfm/sq. ft. of fixed wall area when tested according to ASTM E283 at a static-air-pressure difference of 4 lbf/sq. ft.

s. Water Penetration:

1) Roof Panels: Provide roof panel assemblies with no water penetration as defined in the test method when tested according to ASTM E1646 at a minimum differential pressure of 20 percent of inward-acting, wind-load design pressure of not less than 6.24 lbf/sq. ft. and not more than 12 lbf/sq. ft..
2) Wall Panels: Provide wall panel assemblies with no water penetration as defined in the test method when tested according to ASTM E331 at a minimum differential pressure of 20 percent of inward-acting, wind-load design pressure of not less than 6.24 lbf/sq. ft. and not more than 12 lbf/sq. ft.

t. Wind-Uplift Resistance: Provide metal building systems capable of withstanding the effects of wind forces determined in accordance with the governing codes using wind design factors shown on the Drawings. Provide roof panel assemblies that meet requirements of UL 580 for the following wind-uplift resistance:

1) Class 90.

2.2 MANUFACTURERS

A. Products and Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Rigid Clear Span and Modular Frame Structural Systems; SLR II Roof Panels and Thermalclad Shallow Plank Wall Panels by Varco Pruden Buildings a Division of BlueScope Buildings North America, Incorporated.
2. Or equal.

2.3 STRUCTURAL FRAMING MATERIALS

A. Hot-Rolled Structural Shapes: ASTM A36, A529, A572, or A992.

B. Steel Tubing or Pipe: ASTM A500, Grade B; ASTM A501 or ASTM A53, Grade B.

C. Steel Plate, Bar or Strip: ASTM A36, A529, A570, or A572.

D. Structural Steel Sheet: Hot-rolled, ASTM A570, Grade 50 or Grade 55; hot-rolled, ASTM A568; or cold-rolled, ASTM A611, structural quality, matte (dull) finish.

E. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653, structural quality, Grade 50, with G60 coating designation; mill-phosphatized.

F. Metallic-Coated Steel Sheet Pre-painted with Coil Coating: Steel sheet metallic coated by the hot-dip process and pre-painted by the coil-coating process to comply with ASTM A755 and the following requirements:
   1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653, G90 coating designation; structural quality.
   2. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A792, Class AZ50 coating, Grade 40; structural quality.

G. Non-High-Strength Bolts, Nuts, and Washers: ASTM A307, Grade A; carbon steel, hex-head bolts; carbon steel nuts; and flat, unhardened steel washers.
   1. Finish: Hot-dip zinc coating, ASTM A153, Class C.

H. High-Strength Bolts, Nuts, and Washers: ASTM A325, Type 1, heavy, hex-head structural steel bolts, heavy hex carbon steel nuts, and hardened carbon steel washers.
   1. Finish: Hot-dip zinc coating, ASTM A153, Class C.

I. Anchor Rods, Bolts, Nuts, and Washers:
   1. Headed Bolts: ASTM A307, Grade A; carbon-steel, hex-head bolts; and carbon-steel nuts.
   2. Headed Bolts: ASTM A325, Type 1, heavy hex steel structural bolts and heavy hex carbon-steel nuts.

3. Headed Bolts: ASTM A490, Type 1, heavy hex steel structural bolts and heavy hex carbon-steel nuts.
4. Washers: ASTM A36.

J. Primers: As selected by manufacturer for compatibility with finish paint systems specified in Section 09 91 00, and capable of providing a sound substrate for Site-applied topcoats, despite prolonged exposure without topcoat protection.

2.4 PANEL MATERIALS

A. Metallic-Coated Steel Sheet Pre-painted with Coil Coating: Steel sheet metallic coated by the hot-dip process and pre-painted by the coil-coating process to comply with ASTM A755, and the following:
1. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A792, Class AZ50 coating, Grade 40; structural quality.
2. Surface: Manufacturer's standard stucco-embossed finish.

B. Panel Sealants: Provide the following:
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 C920; one-part elastomeric polyurethane, polysulfide, or silicone-rubber sealant; of type, grade, class, and use classifications required to seal joints in panels and remain weathertight; and as recommended by metal building system manufacturer.

2.5 INSULATION MATERIALS

A. Fire-Test-Response Characteristics for Insulation: Provide insulation with the fire-test-response characteristics indicated, as determined by testing identical products in compliance with test methods specified below by a testing and inspecting agency acceptable to governing authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
1. Surface-Burning Characteristics: ASTM E84.
2. Fire-Resistance Ratings: ASTM E119.
3. Combustion Characteristics: Type I, ASTM E136.

B. Glass-Fiber-Blanket Insulation: Thermal insulation shall be flexible, resilient, odorless, incombustible; complying with ASTM C991, Type I, of 0.5-pound per cubic foot density, thickness as shown, with a flame-spread rating of 25 or less, and 2-inch wide, continuous, vapor-tight edge tabs.

C. Vapor-Retarder Facing: Complying with ASTM C1136, with permeance not greater than the following when tested according to ASTM E96, Desiccant Method:
   1. Composition: Polypropylene-faced, fiberglass-polyester-blend fabric backing, with permeance not greater than 0.02 perm.

D. Retainer Strips: 0.019-inch thick, formed, galvanized steel or polyvinylchloride retainer clips colored to match insulation facing.

E. Vapor-Retarder Tape: As recommended by the manufacturer.

2.6 DOOR AND FRAME MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653, commercial-quality, with G60 coating designation; mill-phosphatized.

2.7 AUXILIARY AND ACCESSORY MATERIALS

A. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound, free of asbestos fibers, sulfur components, and other deleterious impurities.

B. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with ASTM C1107, of consistency suitable for application, and with a 30-minute working time.

C. Shop Primer and Finish Painting: As specified in Section 09 91 00.

2.8 FABRICATION, GENERAL

A. Shop-fabricate bearing plates, and other plates as required for building erection, to the required sizes, sections and profiles, complete with base plates welded in place, and with all required holes for anchoring or connections shop-drilled, or punched, to template dimensions.
   1. Shop Connections: Riveted, bolted, or welded.
   2. Site Connections: Bolted.

B. Fabricate components, and necessary field connections required for erection, to permit easy assembly and disassembly. Fabricate components such that once assembled they may be disassembled, repackaged and reassembled with a minimum amount of labor and maximum salvageability.

C. Clearly and legibly mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.

D. Fabricate components in a manner that once assembled in the shop, they may be disassembled, repackaged, and reassembled at the Site.

E. Fabricate framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Cold-formed members shall be free of cracks, tears, and ruptures.

F. Primary Framing:
   1. Shop-fabricate framing components to indicated size and section with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted Site-assembly.
   2. Make shop connections by welding or by using high-strength bolts.
   3. Join flanges to webs of built-up members by a continuous submerged arc-welding process.
   4. Brace compression flange of primary framing by angles connected between frame web and purlin or girt web, so flange compressive strength is within allowable limits for any combination of loadings.
   5. Brace webs against buckling in beam-column connections of moment frames.
   6. Weld clips to frames for attaching secondary framing members.

G. Secondary Framing:
   1. Shop-fabricate framing components to indicated size and section by roll-forming or break-forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place.
   2. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.
   3. Make shop-connections by welding or by using non-high-strength bolts.

H. Shop-Painting: Clean surfaces to be primed of loose mill scale, rust, dirt, oil, grease, and other matter that might interfere with paint bond. Follow procedures and substrate preparation recommendations of the painting manufacturers for the paint systems specified in Section 09 91 00, Painting.

I. Factory-Priming for Site-Painted Finish: Apply the specified primer immediately after cleaning and pretreating.

2.9 STRUCTURAL FRAMING FABRICATION

A. Primary Framing:
   1. Provide metal building system manufacturer's standard structural primary framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafter, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind and seismic bracing.
      a. Provide frames with attachment plates, bearing plates, and splice members. Factory drill for Site-bolted assembly. Provide frame span and spacing indicated.
      b. Slight variations in span and spacing may be acceptable if necessary to meet manufacturer's standard, as approved by ENGINEER.
   2. Rigid Clear-Span Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural steel shapes.
   3. Frame Configuration: Single gable.
   4. Exterior Column Type: Uniform depth.
   5. Exterior Column Type: Tapered depth.
   6. Rafter Type: Tapered.

B. Secondary Framing:
   1. Provide metal building system manufacturer's standard structural secondary framing members, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Fabricate framing from cold-formed, structural steel sheet or roll-formed, metallic-coated steel sheet pre-painted with coil coating, unless otherwise shown or specified.
   2. Purlins: C or Z-shaped sections; fabricated from minimum 0.0598-inch thick steel sheet, built-up steel plates, or structural steel shapes; minimum 2-1/2-inch wide flanges.
      a. Depth: To meet system performance requirements.
   3. Girts: C or Z-shaped sections; fabricated from minimum 0.0598-inch thick steel sheet, built-up steel plates, or structural steel shapes. Form ends of Z-sections with stiffening lips angled 45 to 50 degrees to flange and with minimum 2-1/2-inch wide flanges.
      a. Depth: To meet system performance requirements.
   4. Eave Struts: Unequal-flange, C-shaped sections; fabricated from 0.0598-inch thick steel sheet, built-up steel plates, or structural steel shapes; to provide adequate backup for both roof and wall panels.
   5. Flange and Sag Bracing: Minimum 1-5/8-inch by 1-5/8-inch structural steel angles, with a minimum thickness of 0.0598-inch, to stiffen primary frame flanges.
   6. Base or Sill Angles: Minimum 3-inch by-2-inch by 0.0747-inch thick, zinc-coated (galvanized) steel sheet.

7. Purlin and Girt Clips: Minimum 0.0747-inch thick, zinc-coated (galvanized) steel sheet.
8. Secondary End-Wall Framing: Manufacturer's standard sections fabricated from minimum 0.0747-inch thick, zinc-coated (galvanized) steel sheet.
9. Framing for Openings: Channel shapes; fabricated from minimum 0.0598-inch thick, cold-formed, structural steel sheet or structural steel shapes. Frame head and jamb of door openings, and head, jamb, and sill of other openings.
10. Miscellaneous Structural Members: Manufacturer's standard sections fabricated from cold-formed, structural steel sheet; built-up steel plates; or zinc-coated (galvanized) steel sheet; designed to withstand required loads.

C. End-Wall Framing:
1. Provide metal building system manufacturer's standard primary end-wall framing fabricated for Site-bolted assembly.
2. End-Wall and Corner Columns: I-shaped sections fabricated from structural-steel shapes; shop-welded, built-up steel plates; or C-shaped, cold-formed, structural steel sheet; with minimum thickness of 0.0747-inch.
3. End-Wall Rafters: C-shaped, cold-formed, structural steel sheet; with minimum thickness of 0.0598-inch.

D. Canopy Framing:
1. Provide metal building system manufacturer's standard structural framing system, designed to withstand required loads, fabricated from shop-welded, built-up steel plates or structural steel shapes.
2. Provide frames with attachment plates and splice members, factory drilled for Site-bolted assembly.
   a. Type: Straight-beam, eave type.

E. Bracing: Provide adjustable wind and seismic bracing as follows:
1. Rods: ASTM A36; ASTM A572, Grade D; or ASTM A529, Grade 50; 1/2-inch diameter steel minimum; threaded full length or threaded a minimum of 12 inches at each end.

F. Bolts: Provide stainless steel bolts, unless structural framing components are in direct contact with roof and wall panels. Provide galvanized bolts when structural framing components are in direct contact with roof and wall panels.

2.10 ROOF PANEL FABRICATION

A. Standing Seam Roof Panels: Manufacturer's standard panels complying with the following:

1. Vertical-Rib Roof Panels: Fabricate flat-pan panels from metallic-coated steel sheets pre-painted with coil-coating, factory-formed to provide 24-inch coverage; with 2-inch high, inverted-L, vertical ribs at panel edges. Design panels for mechanical attachment to roof purlins using concealed clips in side laps. Factory-apply sealant at each interlocking joint. Comply with the following:
    a. Material: Aluminum-zinc alloy-coated steel.
    b. Yield Strength: 50-ksi.
    c. Metal Thickness: 24 gage.
    d. Joint Type: Double-folded, mechanically seamed type.
    e. Clip System: Floating to accommodate thermal movement.

B. Roof Panel Auxiliary System Components: Provide components required for a complete roof panel assembly including trim, copings, fascia, mullions, sills, corner units, ridge closures, clips, seam covers, battens, flashings, gutters, sealants, gaskets, fillers, closure strips, and similar items. Match materials and finishes of roof panels, unless otherwise indicated.
    1. Closures: Provide closures at eave and ridge, fabricated of same metal as roof panels.
    2. Clips: Minimum 0.0625-inch thick, stainless steel panel clips designed to withstand negative-load requirements.
    3. Cleats: Mechanically seamed cleats formed from minimum 0.0250-inch thick, stainless steel or nylon-coated aluminum sheet.
    4. Thermal Spacer Blocks: Where panels attach directly to purlins, provide 1-inch thick, thermal spacer blocks; fabricated from extruded polystyrene.
    5. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.

2.11 WALL PANEL FABRICATION

A. Insulated Wall Panels: Provide manufacturer's double-walled foam insulated panels complying with the following:
    1. Fabricate from 50-ksi metallic-coated steel sheets pre-painted with a coil-coating. The exterior panels are factory-formed, embossed with vertical lines. The interior panels are a planked design. The composite panels are 42 inches wide and 3 inches deep with offset tongue-and-groove side lap joints. Panels shall be secured with concealed fasteners. The panel core is foamed-in-place non-CFC polyurethane. Factory apply sealant at each interlocking joint. Comply with the following:
        a. Material: Aluminum-zinc alloy-coated steel.
        b. Panel Metal Thickness Interior and Exterior: 26 gage.

B. Wall Liner Panels: Fabricate from metallic-coated steel sheets pre-painted with coil-coating, factory-formed to provide 12-inch coverage, with raised

major ribs at 12 inches on centers, and intermediate stiffening ribs symmetrically spaced between major ribs for full length of panel. Design panels for mechanical attachment to structure using exposed fasteners, lapping major ribs at panel edges. Comply with the following:

1. Material: Aluminum-zinc alloy-coated steel.
2. Yield Strength: 50-ksi.
3. Metal Thickness: 24 gage.
4. Panel Height: 1-1/4 inches.

C. Wall Panel Accessories:

1. Provide components required for a complete wall panel assembly, including trim, copings, mullions, sills, corner units, clips, seam covers, battens, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match materials and finishes of panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.

2.12 FASCIA AND SOFFIT PANEL FABRICATION

A. Fascia Panels: Manufacturer's standard panels complying with the following:

1. Match roof panel profile and material.

B. Soffit Panels: Manufacturer's standard panels complying with the following:

1. Match wall panel profile and material.
2. Raised-Rib Panels: Fabricate from metallic-coated steel sheets prepainted with coil-coating, factory-formed to provide 3-foot coverage, with raised trapezoidal major ribs at 12 inches on centers, and intermediate stiffening ribs symmetrically spaced between major ribs for full length of panel. Design panels for mechanical attachment to structure using exposed fasteners, lapping major ribs at panel edges. Comply with the following:
   a. Material: Aluminum-zinc alloy-coated steel.
   b. Yield Strength: 80-ksi.
   c. Metal Thickness: 24 gage.
   d. Panel Height: 1 1/4-inches.

C. Finishes: Finish panel surfaces to match adjacent panels as follows:

1. Fascia Panels: Match finish and color of wall panels.
2. Soffit Panels: Match finish and color of wall panels.

2.13 DOOR AND FRAME FABRICATION

A. Personnel Doors: Refer to section 08 11 13, Hollow Metal Doors and Frames.

B. Finish Hardware: Refer to Section 08 71 00.

2.14 AUXILIARY SYSTEM COMPONENTS AND MISCELLANEOUS ACCESSORIES

A. Accessories shall be as specified in Section 8 of the Recommended Guide Specifications in the MBMA Manual, including gutters and downspouts.
   1. Provide sheet metal accessories of same material and in same finish as roof and wall panels, unless otherwise specified.

B. Gutters and Downspouts: Provide the following:
   1. Form from 26 gage, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet pre-painted with coil-coating. Match profile of roof fascia and rake trim.
   2. Gutters: Formed in sections not less than 8 feet in length, complete with end pieces, outlet tubes, and all special pieces that may be required and sized according to SMACNA's "Architectural Sheet Metal Manual." Unless otherwise shown, provide expansion-type slip joint at the center of runs. Furnish gutter supports spaced at 36 inches on centers, constructed of same metal as gutters. Provide standard aluminum wire ball strainers at each outlet.
   3. Downspouts: Formed from 26 gage, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet pre-painted with coil-coating, in sections approximately 10 feet long, complete with elbows and offsets. Join sections with minimum 1-1/2 inches telescoping joints. Provide fasteners at top, bottom and at 5 foot centers designed to securely hold downspouts not less than 1 inch away from walls. Finish downspouts to match wall panels.
   4. Provide preformed rubber weatherseals to completely fill roof corrugation voids prior to installation of contour gutter.
   5. Provide 26-gage galvanized steel closures to close corrugations in wall panels prior to installation of gutters.

C. Contour Eave and Gable Trim: Provide the following:
   1. Gable and eave trim shall be contour type fabricated from 26-gage galvanized steel, ASTM A525, G90 coating.
   2. Gable and eave trim shall have a factory applied paint finish.
   3. Install preformed corner closures to match the configuration of the gable and eave trim.
   4. Install preformed rubber weatherseals to completely fill the roof panel corrugation voids prior to installation of eave trim.
   5. Install preformed wall closures to completely fill the wall panel corrugation voids prior to installation of eave and gable trim. Wall closures shall be 26-gage galvanized steel factory painted in slate black.

D. Flashing and Trim:
   1. Trim and wall panel transitions and other wall accessories for doors and Translucent Panel System and other openings through the metal panels shall be as required to coordinate with doors and other components specified in other Sections and Contracts.
   2. Provide manufacturer's standard profiles to the extent possible. Custom fabricate profiles where required, or shown, and to accommodate the Work of other Sections and Contracts. Provide extruded aluminum trim with polyurethane thermal break for all Translucent Panel System wall openings.
   3. Form flashing and trim from 26 gage, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet pre-painted with coil-coating.
   4. Provide flashing and trim 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, fascias, and fillers. Finish flashing and trim with same finish system as adjacent roof or wall panels.
   5. Door Head and Jamb Opening Trim: Minimum 24 gage steel sheet. Trim head and jamb of door openings, and head, jamb, and sill of other openings.
   6. Base Molding Trim: Provide continuous interior base moldings in all perimeter wall areas, fabricated from 22-gage galvanized steel. Finish shall be slat black. Provide base molding 3-7/8-inches high by 3/4-inch wide with a sloping top.
   7. Pipe Flashing: Premolded, EPDM pipe collar with flexible aluminum ring bonded to base.

E. Personnel Doors and Translucent Panel System: Provide galvanized steel headers, posts, drip gutters and door post flashing and trim all coordinated with selected metal wall panel system for type and location. Provide size shown.

F. Fasteners:
   1. Sheet Panel Fasteners: Manufacturer's standard system of self- tapping screws, bolts and nuts, self-locking rivets, self-locking bolts, end-welded studs, and other suitable fasteners designed to withstand design loads.
   2. Provide metal-backed neoprene washers under heads of fasteners bearing on weather side of panels.
   3. Locate and space fastenings for true vertical and horizontal alignment. Use appropriate fastening tools to obtain controlled uniform compression, for positive seal without rupture of neoprene washer.
   4. Provide fasteners with heads matching color of roofing or siding sheets by means of plastic caps or factory-applied coating. Provide

self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Comply with the following:

a. Fasteners for Roof and Wall Panels: Self-drilling or self-tapping Type 410 stainless steel or zinc-alloy steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of panels.

5. Fasteners for Flashing and Trim: Blind stainless steel rivets or stainless steel self-drilling screws with hex washer head.

G. Roof Curbs: Fabricate curbs from 17 gage, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet pre-painted with coil-coating; with welded top box and bottom skirt, and integral full-length cricket. Fabricate curb sub-framing of minimum 15 gage, angle-, C-, or Z-shaped steel sheet. Fabricate curb and sub-framing to withstand indicated loads, of size and height indicated. Finish roof curbs to match roof panels.

1. Insulate roof curb with 1-inch thick rigid insulation.

H. Service Walkways: Fabricate walkways from 17 gage, zinc-coated (galvanized) steel plank grating; with slip-resistant pattern; and 30-inch overall width. Support walkways on framing system anchored to roof panels without penetrating panel, and complete with predrilled holes, clamps, or hooks for anchoring.

I. Closures: Closed-cell, laminated polyethylene; minimum 1-inch thick, flexible closure strips; cut or premolded to match roof and wall panel profile. Provide closure strips where shown or as required to provide weathertight construction.

2.15 WALL, ROOF AND LINER PANELS, AND AUXILIARY WALL AND ROOF PANEL SYSTEM COMPONENTS COATINGS

A. Comply with NAAMM's standards and recommendations for applying and designating finishes.

B. 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.

C. Fluoropolymer Two-Coat System for Exposed Wall and Roof Panel Surfaces: Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat

containing not less than 70 percent polyvinylidene fluoride resin by weight, with a total minimum dry film thickness of 1-mil and 30 percent reflective gloss when tested according to ASTM D523.

1. Durability: Provide coating field tested under normal range of weather conditions for a minimum of 20 years without significant peel, blister, flake, chip, crack, or check in finish; without chalking in excess of a chalk rating of 8 according to ASTM D4214; and without fading in excess of five Hunter units.
2. Colors, Textures, and Glosses: As selected by ENGINEER from manufacturer's complete selection of standard and custom colors, textures and glosses.

D. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored backer finish, consisting of prime coat and wash coat with a total minimum dry film thickness of 0.5-mil.

E. Protective Coating: Immediately upon completion of the metal siding and roofing finish, apply a transparent, color-coded, strippable-film coating, not less than 1.0-mil dry film thickness, suitable for protection of the finish through completion of erection, and capable of being easily hand-stripped from the surface at that time.

2.16 RELATED MATERIALS AND PRODUCTS

A. Cast-In-Place Concrete: Refer to Section 03 30 00, Cast-In-Place Concrete.

B. Concrete Hardener: Refer to Section 09 61 53, Concrete Hardener.

C. Grounding Systems: Refer to Section 26 05 26, Grounding and Bonding For Electrical Systems.

PART 3 - EXECUTION

3.1 INSPECTION

A. CONTRACTOR shall examine the areas and conditions under which the metal building systems are to be erected and notify ENGINEER in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

3.2 PREPARATION

A. Clean substrates of all substances, including grease, oil, rolling compounds, incompatible primers, and loose mill scale that may impair bond of materials.

B. Clean and prepare items to be finished with field-applied coatings incompliance with Section 09 91 00, Painting.

C. Survey the footings and foundations to assure conformance with approved shop drawings. Correct all deficiencies before beginning structural steel erection.

3.3 ERECTION OF STRUCTURAL FRAMING

A. Place and secure metal building systems in accordance with approved Shop Drawings, and the Contract Documents.

B. Do not field cut, drill, or alter structural members without written approval from ENGINEER.

C. Set structural framing in locations and to elevations indicated and according to AISC specifications. Maintain structural stability of frame during erection.

D. Baseplates, Leveling Plates and Bearing Plates: Clean concrete bearing surfaces of bond-reducing materials and roughen surfaces before setting baseplates and bearing plates. Clean bottom surface of baseplates and bearing plates.
   1. Set baseplates and bearing plates for structural members on wedges, shims, or setting nuts.
   2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of baseplate or bearing plate before packing with grout.
   3. Pack grout solidly between bearing surfaces and plates so no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
      a. Comply with manufacturer's written instructions for proprietary grout materials.

E. Align and adjust framing members before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Make adjustments to compensate for discrepancies in elevations and alignment.
   1. Level and plumb individual members of structure.

2. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.

F. Primary Framing and End Walls: Erect framing true to line, level, plumb, rigid, and secure. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist cure grout for not less than seven days after placement.
   1. Make field connections using high-strength bolts. Tighten bolts by turn-of-the-nut method.

G. Secondary Framing: Erect framing true to line, level, plumb, rigid, and secure. Fasten secondary framing to primary framing using clips with field connections using non-high-strength bolts. Hold rigidly to a straight line by sag rods.
   1. Provide rake or gable purlins with tight-fitting closure channels and fascia.
   2. Locate and space wall girts coordinated with door and translucent panel system arrangements and heights.
   3. Provide supplemental framing at entire perimeter of openings, including doors and translucent panel system and other penetrations of roof and walls.

H. Bracing: Install bracing in roof and sidewalls as required by design. Tighten rod bracing to avoid sag.

I. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to building structural frame.

3.4 ROOF PANEL INSTALLATION

A. General: Provide roof panels of full length from eave to ridge when possible. Install panels perpendicular to purlins.
   1. Field cutting by torch is not permitted.
   2. Rigidly fasten eave end of roof panels and allow ridge end free movement due to thermal expansion and contraction. Predrill panels.
   3. Provide weatherseal under ridge cap.
   4. Flash and seal roof panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.

5. Install screw fasteners with power tools having controlled torque adjusted to compress neoprene washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
6. Use stainless steel fasteners for exterior applications and galvanized fasteners for interior applications.
7. Locate and space fastenings in true vertical and horizontal alignment.
8. Install ridge caps as roof panel work proceeds.
9. Locate panel splices over, but not attached to, structural supports. Stagger panel splices to avoid a four-panel lap splice condition.

B. Standing Seam Roof Panels: Fasten roof panels to purlins with concealed clips at each standing seam joint. Install clips over top of insulation at location and spacing shown on approved Shop Drawings.
1. Install clips to supports with self-drilling fasteners.
2. Crimp standing seams with manufacturer-approved motorized seamer tool so clip, panel, and factory-applied side-lap sealant are completely engaged.
3. At panel splices, nest panels with minimum 6-inch end lap, sealed with butyl sealant and fastened together by interlocking clamping plates.

3.5 WALL PANEL INSTALLATION

A. General: Provide panels full height of building when possible. Install panels perpendicular to girts.
1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Install panels with vertical edges plumb. Lap ribbed or fluted sheets one full rib corrugation. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
2. Unless otherwise indicated, begin panel installation at corners with center of rib lined up with line of framing.
3. Site-cutting of wall panels with a torch is not permitted.
4. Align bottom of wall panels and fasten with blind rivets, bolts, or self-tapping screws.
5. Fasten flashing and trim around openings and similar elements with self-tapping screws.
6. When two rows of panels are required, provide flashing between panels. Locate panel splices over structural supports.
7. When building height requires two rows of panels at gable ends, align lap of gable panels over wall panels at eave height.
8. Install screw fasteners with power tools having controlled torque adjusted to compress neoprene washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
9. Provide weather-resistant escutcheons for pipe and conduit penetrating exterior walls.

10. Flash and seal wall panels with weather closures under eaves and rakes, along lower panel edges, and at perimeter of all openings.
11. Apply elastomeric sealant continuously between metal base channel and concrete, and as required for waterproof construction. Handle and apply sealant and backup according to sealant manufacturer's written instructions.
12. Use stainless steel fasteners for exterior applications and galvanized fasteners for interior applications.
13. Locate and space fastenings in true vertical and horizontal alignment.

B. Insulated Panels: Install wall panels on exterior side of girts. Attach panels to supports with fasteners as recommended by manufacturer.

C. Liner Panels: Install panels on interior side of girts at locations indicated. Fasten with exposed fasteners as recommended by manufacturer.

3.6 FASCIA AND SOFFIT PANEL INSTALLATION

A. General: Provide panels full width of fascia and soffits. Install panels perpendicular to support framing.
1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Install panels with vertical edges plumb. Lap ribbed or fluted panels one full rib corrugation. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
2. Site-cutting of fascia and soffit panels with a torch is not permitted.
3. Fasten flashing and trim around openings and similar elements with self-tapping screws.
4. Install screw fasteners with power tools having controlled torque adjusted to compress neoprene washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
5. Use stainless steel fasteners for exterior applications and galvanized fasteners for interior applications.
6. Locate and space fastenings in true vertical and horizontal alignment.

B. Fascia Panels: Align bottom of panels and fasten with blind rivets, bolts, or self-tapping screws. Flash and seal panels with weather closures where fascia meet soffits, along lower panel edges, and at perimeter of all openings.

C. Soffit Panels: Flash and seal panels with weather closures where soffit meets walls and at perimeter of all openings.

3.7 INSULATION INSTALLATION

A. General: Install insulation concurrently with panel installation, according to manufacturer's written instructions and as follows:

B. Two-Layers-between-Purlin-with-Spacer-Block Installation: Extend insulation and vapor retarder between purlins. Carry vapor-retarder-facing tabs up and over purlin, overlapping adjoining facing of next insulation course and maintaining continuity of retarder. Install layer of filler insulation over first layer to fill space between purlins formed by thermal spacer blocks. Hold in place with bands and crossbands below insulation.
   1. Thermal Spacer Blocks: Where metal roof panels attach directly to purlins, install thermal spacer blocks.
   2. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.

3.8 DOOR, HARDWARE AND GLASS INSTALLATION

A. General: Comply with manufacturer's written instructions for installing components. Coordinate installation with wall flashings and other building system components.

B. Hollow Metal Doors and Frames: Refer to Section 08 11 13, Hollow Metal Doors and Frames.

C. Glazing: Refer to Section 08 81 00, Glass Glazing.

D. Finish Hardware: Refer to Section 08 71 00, Door Hardware.

3.9 AUXILIARY SYSTEM COMPONENTS AND ACCESSORY INSTALLATION

A. General: Install gutters, downspouts and other accessories according to manufacturer's written instructions and approved shop drawings, with positive anchorage to building and weathertight mounting. Coordinate installation with flashings and other components.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide for thermal expansion of metal units; conceal 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 excessive oil canning, 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 result in waterproof and weather-resistant 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 or bayonet-type 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).
3. Pipe Flashing: Form flashing around pipe penetration and roof panels. Fasten and seal to roof panel as recommended by manufacturer.
4. Dissimilar Materials: Separate metal from incompatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.

C. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 4 feet on centers using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

D. Downspouts: Join sections with 1-1/2-inch 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 on centers in between.
   1. Provide elbow at base of downspout to direct water away from building.

3.10 SITE QUALITY CONTROL

A. Testing Agency: DEPARTMENT will engage a Coordinating Special Inspector, who will direct a qualified independent testing agency, engaged by the CONTRACTOR to perform Site quality control testing.

B. Extent and Testing Methodology: Testing and verification procedures will be required of high-strength bolted connections.
   1. Bolted connections will be visually inspected.
   2. High-strength, field-bolted connections will be tested and verified according to procedures in RCSC's "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A325 or A490 Bolts."

C. Testing agency will report test results promptly and in writing to ENGINEER.

3.11 ADJUSTING, CLEANING AND PROTECTION

A. Touchup Painting: Immediately after erection, clean, prepare, and prime or reprime welds, bolted connections, and abraded surfaces of prime-painted primary and secondary framing, accessories, and bearing plates, as specified in Section 09 91 00, Painting.

B. Roof and Wall Panels: Remove temporary protective coverings and strippable films, if any, as soon as each panel is installed. On completion of panel installation, clean finished surfaces as recommended by panel manufacturer and maintain in a clean condition during construction.
   1. Replace panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

++ END OF SECTION ++

SECTION 22 05 27

PIPE SLEEVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install pipe sleeves, other wall pieces, and escutcheons complete with accessories.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before, the pipe sleeves Work.
   2. Notify other contractors in advance of the installation of the pipe sleeves to provide them with sufficient time for the installation of items included in their contracts that must be installed with, or before, the pipe sleeves work.

C. Related Sections:
   1. Section 07 92 00, Joint Sealants.
   2. Section 22 11 16, Domestic Water Piping.
   3. Section 22 13 16, Sanitary Waste and Vent Piping.
   4. Section 22 18 00, Natural Gas Piping System.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. American National Standards Institute, (ANSI).
      a. ANSI A21.4, Cement-Mortar Lining for Cast-Iron and Ductile Iron Pipe and Fittings.
      b. ANSI A21.6, Cast-Iron Pipe Centrifugally Cast in Metal Molds.
      c. ANSI A21.10, Cast-Iron and Ductile Iron Fittings, 2 thru 48-inches in Water.
      d. ANSI A21.11, Rubber Gasket Joints for Cast-Iron and Ductile Iron Pressure Pipe.
      e. ANSI A21.15, Flanged Cast-Iron and Ductile Iron.
      f. ANSI A21.51, Ductile Iron Pipe Centrifugally Cast in Metal Molds.
      g. ANSI B16.1, Cast Iron Pipe Flanges and Flanged Fittings.
   2. American Water Works Association, (AWWA).
      a. AWWA C104, Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
      b. AWWA C106, Cast-Iron Pipe Centrifugally Cast in Metal Molds.
      c. AWWA C110, Ductile-Iron and Gray-Iron Fittings for Water.

d. AWWA C111, Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
e. AWWA C115, Flanged Ductile-Iron Pipe or Gray-Iron Threaded Flanges.
f. AWWA C151, Ductile-Iron Pipe, Centrifugally Cast for Water.

1.3 QUALITY ASSURANCE

A. Installers' Qualifications:
1. Engage a single installer regularly engaged in pipe sleeves and mechanical seals installation and with experience in the installation of the types of materials required; and who agrees to employ only tradesmen with specific skill and experience in this type of Work. Submit names and qualifications to ENGINEER.
2. Engage a single installer for the entire pipe sleeves and mechanical seals system with undivided responsibility for performance and other requirements.

B. Component Supply and Compatibility:
1. Obtain all products included in this Section regardless of the component manufacturer from a single pipe sleeves and mechanical seal manufacturers.
2. The pipe sleeves and mechanical seal manufacturers to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the pipe sleeves and mechanical seal manufacturers.

C. Regulatory Requirements: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
1. International Building Code, (IBC).
2. American National Standards Institute, (ANSI).
3. American Society of Mechanical Engineers, (ASME).
4. National Fire Protection Association, (NFPA).
5. Underwriters' Laboratories, Incorporated, (UL).
6. Local and State Building Codes and Ordinances.

1.4 SUBMITTALS

A. Shop Drawings: Submit the following:
1. Manufacturer's literature, illustrations, specifications and engineering data.
2. Details of installation.
3. Detailed drawings showing all pipe sleeves and mechanical seals for each piping system. Drawings shall show location, installation and material of all pipe sleeves and mechanical seals.
4. Other technical data related to the specified material and equipment as requested by ENGINEER.

5. Installer's Qualifications.
6. Deviations from Contract Documents.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:
   1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time to prevent delay of the Work.

B. Storage and Protection:
   1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.

C. Acceptance at Site:
   1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify ENGINEER, in writing, if any loss or damage exists to equipment or components. Replace lost equipment or components and repair damage to new condition, in accordance with manufacturer's instructions.

1.6 GENERAL REQUIREMENTS

A. The Contract Documents show the general arrangement and extent of the Work to be completed. The exact location and arrangement of all parts shall be determined as the Work progresses. The exact location of all parts of the Work must be governed by the general building plans and the actual building conditions.

B. The Drawings show an indication of the arrangement of equipment, piping, valves, etc., and are as nearly correct as can be determined in advance of the actual construction of the Work. Piping, equipment, piping, etc. found to interfere with the construction of the building, plumbing apparatus and piping, electrical wiring or other obstructions, etc., must be changed in location to clear such obstructions.

C. The connections shown to the various units are intended as an indication only. The actual connections at the time of installation to be made and arranged to suit the requirements of each case, adequately provide for expansion and circulation and minimize the amount of space required for the same.

D. The Drawings show the general arrangement of all systems. Should local conditions necessitate rearrangement of one or more of the systems, CONTRACTOR, before proceeding with the Work, shall prepare and submit complete drawings showing all details of the proposed rearrangement for written approval by the ENGINEER.

E. The Drawings do not show all offsets, fittings, accessories and details, which may be required. CONTRACTOR shall carefully examine all of the General Construction, Electrical, Mechanical, Structural and other Drawings and the respective Specifications for conditions which may affect the installation of the Work, and shall arrange the Work accordingly, furnishing all required items to meet such conditions which are not specified as work "by others", to complete the systems to the true extent of the Contract Documents.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Pipe Sleeves:
   1. Ferrous and Plastic Pipe: Use standard weight galvanized steel pipe, unless otherwise shown.
   2. Copper Pipe: Use standard weight galvanized steel pipe with mechanical link seals as spacers, unless otherwise shown.

B. Cast Wall Sleeves:
   1. Material: Cast-iron furnished with integral wall collar.
   2. Dimensions: As required for mechanical joint or calked joint pipe to pass through sleeve. Length as required.

C. Mechanical Seals: Provide link type mechanical seals with adjusting bolts suitable for 20 psi working pressure where shown or required.
   1. Manufacturers: Provide products of one of the following:
      a. Thunderline Corporation, Link-Seals.
      b. Advance Products & Systems, Inc., Innerlynx.
      c. The Metraflex Co.
      d. Or equal.
   2. Materials: Mechanical seals through non-fire rated walls or floors:
      a. Pressure Plate: Glass reinforced nylon plastic.
      b. Bolt and Nut: 18-8 stainless steel.
      c. Sealing Element: EPDM rubber.
   3. Materials: Mechanical seals through fire rated walls or floors; two independent mechanical seal assemblies required for each penetration:
      a. Pressure Plate: Low carbon steel, zinc galvanized plated or stainless steel.
      b. Bolt and Nut: Low carbon steel zinc galvanized.
      c. Sealing Element: Silicone rubber.
      d. Fire rating: Three-hour.

D. Wall, Floor and Ceiling Escutcheon Plates:
   1. Manufacturers: Provide products of one of the following:
      a. Bridgeport Plumbing Products, Incorporated.
      b. Pegasus Manufacturing, Incorporated.

c. Or equal.

2. Bare Pipes Passing Through Walls, Floors and Ceilings in any Room: Provide escutcheon plates of cast brass or stamped steel, chrome plated, hinged with setscrews.
3. Insulated Pipes Passing Through Walls, Floors and Ceilings in Finished Rooms: Provide plated escutcheon plates of stamped steel or cast brass, chrome plated, hinged with setscrews.

E. Exterior Walls or Floors: Below grade:
1. Manufacturers: Provide products of one of the following:
   a. Thunderline Corporation, Century-Line Sleeves.
   b. Omni Sleeve.
   c. Or equal.
2. Type: Thermoplastic sleeve for use in new construction where sleeves are exposed to liquid or on exterior walls or floors exposed to backfill only.
3. Integral reinforcing ribs, anchor and waterstop collar textured surface for adhesion to concrete.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
1. Install all items as shown, specified, and as recommended by the manufacturer.
2. Request instructions from ENGINEER, in writing, when there is a conflict between the manufacturer's recommendations and the Contract Documents.
3. Present conflicts to ENGINEER, in writing, who will determine corrective measures to be taken.
4. Do not modify structures to facilitate installation of pipe sleeves, mechanical seals, and accessories, unless specifically approved by ENGINEER.
5. Installation to conform to requirements of all local and state codes.
6. Protection: Equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical damage.

B. Pipe Sleeves:
1. Use sleeves wherever pipes pass through walls, partitions, floors and roofs, unless otherwise shown.
2. All sleeves through floor slabs in finished areas shall extend a maximum of 1/4-inch above finished floor.
3. Anchor sleeves to concrete and masonry walls as shown or otherwise accepted.
4. Sleeves through walls shall be flush with wall face.
5. Calk and seal annular space between pipe and sleeve.
6. All pipe joints and annular spaces in exterior walls or walls subjected to hydrostatic pressure shall be completely watertight.

7. All vertical pipes through sleeves shall be installed with Link Seal "Pyro-Pacs" to maintain 2-hour fire rating between the two fire areas.
8. Size Sleeves to provide annular space as recommended by the mechanical seal manufacturer and as follows:

Pipe Size	Sleeve ID Minus Pipe or Insulation OD
Less than 2-in.	1/2-in. to 3/4-in.
2-in. to 4-in.	3/4-in. to 1-1/4-in.
6-in. to 12-in.	1-1/4-in. to 2-in.

9. For mechanical link seals, size sleeves to provide space required to suit link type seals provided.
10. Do not install sleeves and pipes through structural members unless specifically required due to coordination or obstructions, each sleeve condition shall be submitted for approval.

3.2 FIELD QUALITY CONTROL

A. Inspection:
   1. Examine areas to receive pipe sleeves, mechanical seals, escutcheons and accessories for:
      a. Defects that adversely affect execution and quality of the Work.
      b. Deviations beyond allowable tolerances for pipe sleeves, mechanical seals, escutcheons and accessories.
      c. Start the Work only when conditions are satisfactory.
   2. The ENGINEER reserves the right to reject or authorize replacement of pipe sleeves, mechanical seals, escutcheons and accessories found to be defective.

3.3 ADJUSTING AND CLEANING

A. Adjusting:
   1. Adjust all materials for proper settings.

B. Cleaning:
   1. Thoroughly clean all pipe sleeves, mechanical seals, escutcheons and accessories prior to installation.
   2. Remove all dirt, rust, dust, etc. from all pipe sleeves, mechanical seals and escutcheons in preparation for required painting.
   3. Remove and dispose of all debris and waste from the Site resulting from installation.

++ END OF SECTION ++

SECTION 22 05 29

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified, and required to furnish and install hangers and supports complete with accessories for plumbing piping and equipment.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before, the hangers and supports for plumbing piping and equipment Work.
   2. Notify other contractors in advance of the installation of the hangers and supports to provide them with sufficient time for the installation of items included in their contracts that must be installed with, or before, the hangers and supports work.

C. Related Sections:
   1. Section 05 12 00, Structural Steel Framing.
   2. Section 05 50 05, Anchor Systems.
   3. Section 05 50 13, Miscellaneous Metal Fabrications.
   4. Section 09 91 00, Painting.
   5. Section 22 11 16, Domestic Water Piping.
   6. Section 22 13 16, Sanitary Waste and Vent Piping.
   7. Section 22 18 00, Natural Gas Piping System.
   8. Section 40 05 96, Vibration, Seismic and Wind Controls.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. American National Standards Institute, (ANSI).
      a. ANSI B1.1, Unified Inch Screw Threads. (ASME B1.1).
   2. American Society for Testing and Materials, (ASTM).
      a. ASTM A 36/A 36M, Specification for Carbon Structural Steel.
      b. ASTM A 47/A 47M, Specification for Ferritic Malleable Iron Castings.
      c. ASTM A 307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
      d. ASTM A 575, Specification for Steel Bars, Carbon, Merchant Quality, M-Grades.
      e. ASTM A 668/A 668M, Specification for Steel Forgings, Carbon and Alloy, for General Industrial Use.

3. Federal Specifications, (FS).
   a. FS WW-H-171, Hangers and Supports, Pipe.
4. Manufacturer's Standardization Society, (MSS).
   a. MSS SP 58, Pipe Hangers and Supports - Materials, Design and Manufacture.
   b. MSS SP 69, Pipe Hangers and Supports - Selection and Application.
   c. MSS SP 89, Pipe Hangers and Supports - Fabrication and Installation Practices.
   d. MSS SP 90, Guidelines on Terminology for Pipe Hangers and Supports.

1.3 QUALITY ASSURANCE

A. Installer's Qualifications:
   1. Engage a single installer regularly engaged in hangers and supports installation and with experience in the installation of the types of materials required; and who agrees to employ only tradesmen with specific skill and experience in this type of Work. Submit name and qualifications to ENGINEER.
   2. Engage a single installer for the entire plumbing pipe and equipment hangers and supports system with undivided responsibility for performance and other requirements.

B. Regulatory Requirements: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
   1. American National Standards Institute, (ANSI).
   2. American Society of Mechanical Engineers, (ASME).
   3. National Fire Protection Association, (NFPA).
   4. Underwriters' Laboratories, Incorporated, (UL).
   5. Local and State Building Codes and Ordinances.
   6. Permits: CONTRACTOR shall obtain and pay for all required permits, fees and inspections.

C. Component Supply and Compatibility:
   1. Obtain all products included in this Section regardless of the component manufacturer from a single plumbing pipe and equipment hangers and supports manufacturer.
   2. The plumbing piping and equipment hangers and supports manufacturer shall review and approve all Shop Drawings and other submittals for all components furnished under this Section.
   3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the plumbing piping and equipment hangers and supports manufacturer.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:

a. Details of installation.
b. Detailed drawings showing all hangers and supports for each piping system. Drawings shall show location, installation, material, loads, forces, stresses and deflections of all hangers and supports.

2. Product Data:
a. Manufacturer's literature, illustrations, specifications and engineering data.
b. Other technical data related to the specified material and equipment as requested by ENGINEER.

B. Informational Submittals: Submit the following:
1. Qualifications Statements:
a. Installer's Qualifications.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:
1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time to prevent delay of the Work.

B. Storage and Protection:
1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
2. Store all equipment in covered storage off the ground and prevent condensation and in accordance with the manufacturer’s recommendations for long-term storage.

C. Acceptance at Site:
1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify ENGINEER, in writing, if any loss or damage exists to equipment or components. Replace lost equipment or components and repair damage to new condition, in accordance with manufacturer’s instructions.

1.6 GENERAL REQUIREMENTS

A. The Contract Documents show the general arrangement and extent of the Work to be completed. The exact location and arrangement of all parts shall be determined as the Work progresses. The exact location of all parts of the Work must be governed by the general building plans and the actual building conditions.

B. The Drawings show an indication of the arrangement of equipment, piping, valves, etc., and are as nearly correct as can be determined in advance of the actual construction of the Work. Piping, equipment, etc. found to interfere with

the construction of the building, plumbing apparatus and piping, electrical wiring or other obstructions, etc., must be changed in location to clear such obstructions.

C. The connections shown to the various units are intended as an indication only. The actual connections at the time of installation to be made and arranged to suit the requirements of each case, adequately provide for expansion and circulation and minimize the amount of space required for the same.

D. The Drawings show the general arrangement of all systems. Should local conditions necessitate rearrangement of one or more of the systems, CONTRACTOR, before proceeding with the Work, shall prepare and submit complete drawings showing all details of the proposed rearrangement for written approval by the ENGINEER.

E. The Drawings do not show all offsets, fittings, accessories and details, which may be required. CONTRACTOR shall carefully examine all of the General Construction, Electrical, Mechanical, Structural and other Drawings and the respective Specifications for conditions which may affect the installation of the Work, and shall arrange the Work accordingly, furnishing all required items to meet such conditions which are not specified as work "by others", to complete the systems to the true extent of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

A. Components of hangers and supports shall conform to the following:
   1. Materials:
      a. Bolts: ASTM A 307, Grade A, unless otherwise specified below.
      b. Forgings: ASTM A 668/A 668M.
      c. Malleable Iron: ASTM A 47/A 47M.
      d. Rods and Bars: ASTM A 575.
      e. Threads: Unified Screw Threads, Class 2A and 2B, ANSI B1.1.
      f. Structural Steel: ASTM A 36/A 36M.
   2. Finish:
      a. Steel or Malleable Iron Items: Hot-dipped galvanized, unless otherwise specified or as shown.
      b. Steel or Malleable Iron Materials Used for the Support of Uninsulated Copper Piping: Copper plated.
      c. Framing Members and Fittings: Dip painted with corrosion resistive primer as specified in Section 09 91 00, Painting.
      d. All hangers, rods, bolts, nuts, inserts, washers located in all areas except the electrical room, shall be Type 316 stainless steel.

B. Pipe Attachments: The following types of pipe attachments shall be considered acceptable:
   1. Adjustable Steel Clevis: FS WW-H-171E, Type 1.

2. Steel Double Bolt Pipe Clamp: FS WW-H-171E, Type 3.
3. Steel Pipe Clamp: FS WW-H-171E, Type 4.
4. Adjustable Swivel Pipe Ring: FS WW-H-171E, Type 6.
5. Adjustable Steel Band Hanger: FS WW-H-171E, Type 7.
6. Riser Clamp: FS WW-H-171E, Type 8.
7. Light-Duty Cleves Hanger: FS WW-H-171E, Type 12.
8. Long Clips: FS WW-H-171E, Type 26.
9. Offset J-Hooks: FS WW-H-171E, Type 27.
10. Steel Pipe Covering Protection Saddle: FS WW-H-171E, Type 40A.
11. Insulation Protection Shield: FS WW-H-171E, Type 41.
12. Pipe Saddle Support: FS WW-H-171E, Type 37.
13. Pipe Stanchion Saddle: FS WW-H-171E, Type 38.
14. Pipe Saddle Support with Base: FS WW-H-171E, Type 36.
15. Adjustable Roller Hanger: FS WW-H-171E, Type 42.

C. Structural Attachments: The following types of structural attachments shall be considered acceptable:
1. Side Beam Clamp: FS WW-H-171E, Type 20.
2. Center I-Beam Clamp: FS WW-H-171E, Type 21.
3. Welded Steel Bracket: FS WW-H-171E, Types 32 and 33.
4. Side Beam Bracket: FS WW-H-171E, Type 35.
5. Malleable Iron with Galvanized Finish Concrete Insert: FS WW-H-171E, Type 18. The use of steel concrete inserts is prohibited and NOT acceptable.

D. Hanger Rod Attachments: Use as required to complete assembly:
1. Forged Steel Clevis: FS WW-H-171E, Type 14.
2. Adjustable Turnbuckle: FS WW-H-171E, Type 15.
3. Forged Steel Welders Eye Nut: FS WW-H-171E, Type 17.

E. Expansion Joints:
1. Manufacturers: Provide products of one of the following:
   a. Flexonics Division, Universal Oil Products Company.
   b. Anaconda Metal Hose Division, Anaconda American Brass Company.
   c. Or equal.
2. 2-1/2-inch and Smaller Copper Tubing:
   a. Construction: Two-ply phosphor bronze seamless bellows.
   b. Shrouds: Brass protective shrouds.
   c. End Connections: Male and female solder end fittings or screwed ends with adaptors for screwed to sweat ends.
3. 3-inch and Larger:
   a. Construction: Free flexing expansion joints with stainless steel corrugated members.
   b. End Connections: Welded ends with flanges.

F. Alignment Guides:
1. Type: Semi-steel spider with four guiding fingers and guilding cylinder with base.

2. Manufacturers: Provide products of one of the following:
   a. Flexonics Division, Universal Oil Products Company.
   b. Anaconda Metal Hose Division, Anaconda American Brass Company.
   c. Or equal.

G. Connection Bolts: Materials shall be as specified in other Sections of these Specifications or as shown. Where materials are not specified or shown, they shall be of Type 304 stainless steel with Monel nuts.

H. Toggle Bolts:
   1. Provide zinc plated spring wing toggle bolts of the size required for secure anchorage of individual items, but not less than 1/4-inch diameter, of length required.
   2. Products and Manufacturers: Provide one of the following:
      a. Spring Wing Toggle Bolts by Ramset Fastening Systems.
      b. Rawl Toggle Bolts, Spring Wing Type.
      c. Or equal.

I. CONTRACTOR shall furnish and install all necessary supports, angle iron stands, miscellaneous steel, inserts, anchor bolts and hangers required for all equipment furnished under this Contract, unless otherwise noted. All supports shall meet the requirements of the applicable Sections of Division 05, Metals.

2.2 PAINTING

A. All pipe hangers, supports and restraints shall be painted as required in accordance with the requirements of Section 09 91 00, Painting.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
   1. Install all items as shown, specified, and as recommended by the manufacturer.
   2. Request instructions from ENGINEER, in writing, when there is a conflict between the manufacturer's recommendations and the Contract Documents.
   3. Present conflicts to ENGINEER, in writing, who will determine corrective measures to be taken.
   4. Do not modify structures to facilitate installation of pipe hangers, supports and restraints, unless specifically approved by ENGINEER.
   5. Installation to conform to requirements of all local and state codes.
   6. Protection: Equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical damage.

3.2 FIELD QUALITY CONTROL

A. Inspection:
   1. Examine areas to receive plumbing piping and equipment hangers and supports and accessories for:
      a. Defects that adversely affect execution and quality of the Work.
      b. Deviations beyond allowable tolerances for pipe hangers, supports and restraints and accessories.
      c. Start the Work only when conditions are satisfactory.
   2. The ENGINEER reserves the right to reject or authorize replacement of pipe hangers, supports and restraints and accessories found to defective.

3.3 ADJUSTING AND CLEANING

A. Adjusting:
   1. Adjust all materials for proper settings.

B. Cleaning:
   1. Thoroughly clean all pipe hangers, supports and restraints and accessories prior to installation.
   2. Remove all dirt, rust, dust, etc. from all pipe hangers, supports and restraints in preparation for required painting.
   3. Remove and dispose of all debris and waste from the Site resulting from installation.

3.4 MATERIAL SCHEDULES

A. Hangers, Supports and Restraints for Horizontal Piping:
   1. Space supports and hangers for all piping no farther apart than shown below, unless otherwise shown:
      a. Copper Tube:
         1) All Pipes: 6 feet-0 inch on center.
      b. Steel Pipe:
         1) Pipes up to 1-inch: 6 feet-0 inch on center.
         2) Pipes 1-1/4-inch to 6-inch: 8 feet-0 inch on center.
      c. Cast-Iron Pipe:
         1) Two supports per length.
      d. Plastic Pipe:
         1) 3 feet-0 inch on center for all sizes, unless otherwise recommended by manufacturer for 100°F ambient temperature.

B Hanger Rods: Size hanger rods according to the schedule below, unless noted otherwise.

Nominal Pipe (Inches)	Rod Diameter (Inches)
1/2 through 2	3/8
2-1/2 through 3-1/2	1/2
4 through 5	5/8
6	3/4

C. Supports for Vertical Piping:
   1. Provide riser clamp placed under hub, fitting or coupling with approved solid bearing on steel sleeve at each floor level.
   2. Where riser clamps are used with plastic piping they shall be modified so as not to exert any compressive forces on the pipe.
   3. Support spacing shall not exceed code requirements.
   4. Piping support intervals shall not exceed those listed in Paragraph 3.4.A., above.
   5. Additional supports shall be placed immediately adjacent to any change in piping direction, and on both sides of valves and couplings.
   6. Accurately locate inserts for hanger rods in forms before concrete is placed.
   7. Use Type 304 stainless steel expansion anchor assemblies of the capsule polyester resin adhesive type and only to support rods, hangers and brackets for piping 1-inch and smaller no other type will be considered and only if the expansion anchors are designed to carry 100 percent of the full load, hanger, and/or bracket and pipe load.

D. Supports for water meters and backflow preventers: Provide pipe saddle supports with base anchored to floor.

E. Structural members shall conform to Section 05 12 00, Structural Steel Framing.

F. Anchor bolts, expansion anchors and concrete inserts shall conform to Section 05 05 33, Anchor Systems.

G. Miscellaneous metal fabrications shall conform to Section 05 50 13, Miscellaneous Metal Fabrications.

H. Allow clearances for expansion and contraction of piping.

I. Anchors shall be designed to prevent any pipe movement at pipe anchorage points. Anchors shall be securely fastened to the construction directly or indirectly through structural framing:
   1. Piping 2-1/2-inches and Smaller: Anchor horizontal runs over 50 feet to midpoint to allow expansion toward expansion compensators (anchor intervals shall not exceed 30 feet) or elbows.
   2. Piping 3-inches and Larger: Anchor horizontal runs over 100 feet at mid-points to force expansion toward expansion compensators.
   3. Provide alignment guides in accordance with expansion compensator manufacturer recommendations.

J. Provide expansion compensators where necessary to absorb expansion and contraction in heating lines and as follows:
   1. Thirty feet on center of copper piping.
   2. Fifty feet on center of steel piping.

K. Locate first set of alignment guides within four pipe diameters of the anchor or expansion compensator, the second set of pipe alignment guides shall be located within fourteen pipe diameters of the first guides.

+ + END OF SECTION + +

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SECTION 22 05 93

DISINFECTION OF PLUMBING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as specified, and required to complete all plumbing system disinfection Work.

B. Coordination:
   1. Review the extent of plumbing systems to be disinfected to ensure that all items have been installed in sufficient time to allow the disinfection Work to proceed.
   2. Notify other contractors in advance of the disinfection of plumbing systems to provide them with sufficient time for the installation of items that must be installed with, or before, the disinfection of the plumbing systems Work.

C. Related Sections:
   1. Section 09 91 00, Painting.
   2. Section 22 11 16, Domestic Water Piping.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. American National Standards Institute, (ANSI).
   2. American Society for Testing and Materials, (ASTM).
   3. American Water Works Association, (AWWA).
      a. AWWA C651, Disinfecting Water Mains.
      b. AWWA C652, Disinfection Water Storage Facilities and Equipment.

1.3 QUALITY ASSURANCE

A. Contractor's Qualifications:
   1. Contractor regularly engaged in potable water piping and equipment disinfections and who agrees to employ only tradesmen with specific skill and experience in this type of Work. Submit name and qualifications to ENGINEER.

B. Regulatory Requirements: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
   1. American National Standards Institute, (ANSI).
   2. Local and State Building Codes and Ordinances.

3. Permits: CONTRACTOR shall obtain and pay for all required permits, fees and inspections.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Testing Plans, Procedures, and Testing Limitations:
      a. Description of the forms of chlorine, dosages, and proposed methods of disinfection.

B. Informational Submittals: Submit the following:
   1. Site Quality Control Submittals:
      a. Bacteriological test reports formatted according to requirements of authorities having jurisdiction.
   1. Qualification Statements:
      a. Contractor's Qualifications.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide all necessary equipment and materials, including chemicals, to perform the disinfecting operations.

PART 3 - EXECUTION

3.1 DISINFECTION

A. General:
   1. Pumps, hydrants, and other water handling equipment items that are part of the potable water distribution system shall be disinfected in the same manner as described herein for the pipelines.
   2. The method to be followed shall be that prescribed by the local authorities or in accordance with the procedures recommended by AWWA C651 and C652, except as specified below.
   3. Before application of chlorine, flush the piping system at a velocity of not less than 2.5 feet per second. Do not flush the system if the tablet method, as specified in the above standard is used.
   4. After the applicable retention period, flush the system using potable water.

3.2 FIELD QUALITY CONTROL

A. Testing: Perform bacteriological tests in accordance with AWWA C651.

+ + END OF SECTION + +

SECTION 22 07 19

PLUMBING PIPING INSULATION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install plumbing piping insulation complete with accessories.
   2. The Contract Documents show the general arrangement and extent of the Work under this Section. Exact location and arrangement of all parts of the Work under this Section will be determined as the Work progresses. Exact location of the Work under this Section will be governed in part by building layout and conditions at the Site.
   3. The Drawings do not show all offsets, fittings, accessories and details, for which insulation Work may be required. After examining the Contract Documents and conditions at the Site for conditions that affect the plumbing piping insulation Work, shall arrange the Work accordingly, providing all items required for such conditions that are not included under other Sections or other contracts to complete the systems.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items that must be installed with or before plumbing piping insulation Work.
   2. Notify other contractors in advance of the installation of plumbing piping insulation to provide them with sufficient time for installing items included in their contracts that must be installed with or before plumbing piping insulation Work.

C. Related Sections:
   1. Section 22 11 16, Domestic Water Piping.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ANSI A117.1, Guidelines for Accessible and Usable Buildings and Facilities.
   2. ASTM C449/C449M, Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finish Cement.
   3. ASTM D1784, Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
   4. Federal Specification (FS) SS-C-160, Cement, Insulation, Thermal.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Installer:
      a. Engage installer regularly engaged in plumbing piping insulation installation and with experience installing the types of materials required; and employ only tradesmen with specific skill and experience in this type of Work. Submit name and qualifications to ENGINEER.
      b. Engage a single plumbing piping insulation installer for entire piping insulation system, with undivided responsibility for performance and other requirements.

B. Component Supply and Compatibility:
   1. Obtain all products included in this Section regardless of component manufacturer, from a single piping insulation Supplier.
   2. Plumbing piping insulation Supplier shall review and approve or prepare all Shop Drawings and other submittals for components furnished under this Section.
   3. Components shall be suitable for specified service conditions and shall be integrated into overall assembly by plumbing piping insulation Supplier.

C. Regulatory Requirements: Comply with the following.
   1. Americans with Disabilities Act (ADA).
   2. Applicable building codes and ordinances as listed in Section 01 42 00, References.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Product Data:
      a. Manufacturer's literature, illustrations, specifications, and engineering data.
      b. Other technical data related to specified materials as requested by ENGINEER.

B. Informational Submittals: Submit the following:
   1. Manufacturer's Instructions:
      a. Manufacturer's recommended installation instructions.
   2. Qualifications Statements:
      a. Installer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling, and Unloading:
   1. Deliver products to Site to ensure uninterrupted progress of the Work.

2. Inspect all boxes, crates, and packages upon delivery to Site and notify ENGINEER in writing of loss or damage to products. Promptly remedy loss and damage to new condition per manufacturer's instructions.
3. Conform to Section 01 65 00, Product Delivery Requirements.

B. Storage and Protection:
1. Keep all products off ground using pallets, platforms, or other supports, in covered storage. Protect materials from damage and deterioration.
2. Prevent condensation in materials and packaging in accordance with manufacturer's recommendations for long-term storage
3. Conform to Section 01 66 00, Product Storage and Handling Requirements.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Fiberglass Insulation:
1. Products and Manufacturers: Provide one of the following:
   a. Fiberglass 25ASJ/SSL, by Owens-Corning Fiberglass Corporation.
   b. Certain Teed Snap-On ASJ-SSL, by Certain Teed Products Corporation.
   c. Or equal.
2. Type: Heavy-density sectional pipe insulation with vapor barrier with self-sealing lap.
3. Thermal Conductivity: 0.22 Btu-inch per hour per square foot per degree F at 150 degrees F mean temperature.
4. Fire Hazard Classification:
   a. Flame Spread: 25.
   b. Smoke Developed: 50.
5. Density: Three pounds per cubic foot (pcf) minimum.
6. Fittings: Molded fiberglass.
7. Jointing Materials: Manufacturer's recommended adhesives and tape.
8. Valve Insulation: Miter cut nesting size covering segments of same thickness as pipeline, for insulation of valves.

B. Calcium Silicate Insulation at Insulation Protection Shields:
1. Products and Manufacturers: Provide one of the following:
   a. Kaylo 10, by Owens-Corning Fiberglass Corporation.
   b. Thermo 12, by Johns-Manville.
   c. Or equal.
2. Type: Calcium silicate pipe insulation.
3. Thermal Conductivity: 0.40 Btu-inch per hour per square foot per degree F at 200 degrees F mean temperature.
4. Fire Hazard Classification:
   a. Flame Spread: Zero.
   b. Smoke Developed: Zero.
5. Density: 14 pounds per cubic foot (pcf).

6. Compressive Strength: 140 psi.
7. Cut insulation 0.5-inch longer than insulation shield upon which it rests.

C. Flexible Elastomeric Insulation:
1. Products and Manufacturers: Provide one of the following:
   a. Armaflex Pipe Insulation, by Armstrong World Industries, Inc.
   b. Ensolex, by U.S. Rubber.
   c. Or equal.
2. Type: Flexible elastomeric thermal insulation.
3. Fire Hazard Classification:
   a. Flame Spread: 25 or less.
   b. Smoke Developed: 50 or less.
4. Thermal Conductivity: 0.27 Btu-inch per hour per square foot per degree F.
5. Water Absorption: Five percent by weight.
6. Fittings: Miter cut and glued in accordance with manufacturer's recommendations.
7. Jointing Materials: Manufacturer's recommended adhesives and tape.
8. Valve Insulation: Miter cut nesting size covering segments of same thickness as pipeline, for insulation of valves.

D. Pipe Jacketing and Valve Covers:
1. Manufacturers: Provide products of one of the following:
   a. Childers Product Company.
   b. Certain-Teed Products Corporation.
   c. Zeston PVC Products/Schuller International, Inc.
   d. Or equal.
2. Weatherproof Jacket (for insulated piping and appurtenances located outdoors, and where shown or indicated):
   a. Type: Smooth-embossed, Type 316 stainless steel jacket.
   b. Thickness: 0.016 inches.
   c. Moisture Barrier: Polycraft.
   d. Fastening: Pre-formed "Z"-lock seam with two-inch butt strap with waterproof sealant.
   e. Bands: 1/2-inch Type 316 stainless steel bands with wing seals.
   f. Fittings: Pre-fabricated Type 316 stainless steel fittings, 0.016-inch thickness.
3. PVC Jacketing (for insulated piping and appurtenances located indoors, unless otherwise shown or indicated):
   a. 25/50 PVC, conforming to ASTM D1784, Class 16354-C and C-585
   b. Thickness: 20 mils.
   c. Color: White.
   d. Finish: Glossy.
   e. Temperature: Suitable for 150 degrees F, minimum.

E. Insulating Cement:
1. Products and Manufacturers: Provide one of the following:
   a. Therm Kote 1, by Ryder Sales.
   b. Smooth Kote, by Insulco Industries, Inc.

c. Or equal.

2. Type: Asbestos-free, hydraulic setting refractory type insulating cement, non-corrosive to ferrous metals.
3. References:
   a. ASTM C449/C449M.
   b. FS SS-C-160, Type 111 GRF.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine conditions under which materials are to be installed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:
   1. Piping systems to be insulated and associated insulation thicknesses are specified in the schedule at the end of this Section.
   2. Thoroughly clean all piping, insulation, and accessories prior to installation.
   3. Remove from piping all dirt, rust, dust, and other materials detrimental to proper installation of insulation.
   4. Install items as shown, specified, and as recommended by manufacturer.
   5. Request interpretation from ENGINEER if there is conflict between manufacturer's recommendations and the Contract Documents.
   6. Do not modify structures to facilitate installation of piping insulation unless approved by ENGINEER.
   7. Installation of plumbing piping insulation shall conform to Laws and Regulations.
   8. Surfaces of piping, valves, and fittings shall be clean and dry before applying insulation.
   9. Install piping insulation after associated piping system has been successfully tested.
   10. Provide high-density insulation pipe support inserts at each hanger and shield extending halfway up the pipe insulation cover and extending along pipe at least six inches on each side of hanger. Securely fasten shield with pipe straps at each end. Insulate pipe anchors adequately to prevent moisture condensation problems.
   11. Cover insulated surfaces of outdoor piping with stainless steel jacketing neatly fitted and firmly secured. Lap the seams at least two inches. Apply over vapor barrier, where applicable.
   12. Protection: Piping insulation materials applied each day shall have vapor barrier applied the same day and exposed ends shall be temporarily protected with moisture barrier and sealed to pipe.

3.3 ADJUSTING

A. Adjusting:
   1. Adjust or replace, as required, poorly-fitted joints.

3.4 SCHEDULES

A. Piping Insulation Schedule: Insulate plumbing piping as specified below, unless otherwise specified or shown:
   1. All hot, cold, tempered and tepid water piping 2.5-inch diameter and smaller: Insulation thickness shall be one-inch minimum.
   2. All hot, cold, tempered and tepid water piping three-inch diameter and larger: Insulation thickness shall be 1.5-inch minimum.

+ + END OF SECTION + +

SECTION 22 10 53

INSTALLATION OF PLUMBING PIPING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified, and required to furnish and install plumbing piping systems complete with accessories.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before, the installation of plumbing piping Work.
   2. Notify other contractors in advance of the installation of the installation of plumbing piping to provide them with sufficient time for the installation of items included in their contracts that must be installed with, or before, the installation of plumbing piping Work.

C. Related Sections:
   1. Section 09 91 00, Painting.
   2. Section 22 11 16, Domestic Water Piping.
   3. Section 22 13 16, Sanitary Waste and Vent Piping.
   4. Section 22 18 00, Natural Gas Piping System.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. American National Standards Institute, (ANSI).
      a. ANSI B13.1, Code for Pressure Piping.
      b. ANSI B31.1, Power Piping.
   2. American Society for Testing and Materials, (ASTM).
   3. American Welding Society, (AWS).
      a. AWS D10.9, Welding Procedures and Welders for Piping and Tubing.
   4. Institute of Electrical and Electronic Engineers, (IEEE).
   5. National Electrical Code, (NEC).
   6. National Electrical Manufacturers' Association, (NEMA).
   7. National Fire Protection Association, (NFPA).
   8. Underwriters' Laboratories, Incorporated, (UL).

1.3 QUALITY ASSURANCE

A. Installer's Qualifications:
   1. Engage a single installer regularly engaged in plumbing piping installation and with experience in the installation of the types of materials required; and who agrees to employ only tradesmen with specific skill and experience in this type of Work. Submit name and qualifications to ENGINEER.
   2. Engage a single installer for the entire plumbing piping system with undivided responsibility for performance and other requirements.

B. Regulatory Requirements: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
   1. American National Standards Institute, (ANSI).
   2. Institute of Electrical and Electronic Engineers, (IEEE).
   3. National Electrical Code, (NEC).
   4. National Electrical Manufacturers' Association, (NEMA).
   5. National Fire Protection Association, (NFPA).
   6. Underwriters' Laboratories, Incorporated, (UL).
   7. Local and State Building Codes and Ordinances.
   8. Permits: CONTRACTOR shall obtain and pay for all required permits, fees and inspections.

C. Component Supply and Compatibility:
   1. Obtain all equipment included in this Section regardless of the component manufacturer from a single installation of plumbing piping manufacturer.
   2. The installation of plumbing piping manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
   3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the installation of plumbing piping manufacturer.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. 1/4-inch scale piping layouts, dimensioned to show length of piping runs, pipe sizes, support spacing and expansion provisions.
      b. Details of installation, including piping supports.
      c. Submit pipe schedule with laminate construction, sizes, thickness, vacuum pressure, weight per foot pressure, spans, joint type and flange data.
   2. Product Data:
      a. Manufacturer's literature, illustrations, specifications and engineering data.
      b. Flexible connections.
      c. Other technical data related to the specified material and equipment as requested by ENGINEER.

d. Gasket material.

B. Informational Submittals: Submit the following:
1. Qualifications Statements:
a. Installer's qualifications.

C. Closeout Submittals: Submit the following:
1. Record Drawings:
a. During progress of the Work keep an up-to-date set of the Drawings showing field and Shop Drawing modifications. Immediately upon completion of the piping Work submit CADD drawings showing the actual in-place installation of all piping and equipment installed under this Section at a scale satisfactory to the CITY. The Record Drawings shall show all piping on plans and in sections, with all reference dimensions and elevations required for complete Record Drawings of the piping systems. Two paper prints shall also be furnished. The prints and electronic copies of the CADD files shall be furnished no later than 30 days after completion of the Contract and prior to final payment.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:
1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time to prevent delay of the Work.

B. Storage and Protection:
1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
2. Store all equipment in covered storage off the ground and prevent condensation and in accordance with the manufacturer's recommendations for long-term storage.

C. Acceptance at Site:
1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify ENGINEER, in writing, if any loss or damage exists to equipment or components. Replace lost equipment or components and repair damage to new condition, in accordance with manufacturer's instructions.

1.6 GENERAL REQUIREMENTS

A. The Contract Documents show the general arrangement and extent of the Work to be completed. The exact location and arrangement of all parts shall be determined as the Work progresses. The exact location of all parts of the Work

must be governed by the general building plans and the actual building conditions.

B. The Drawings show an indication of the arrangement of equipment, piping, valves, etc., and are as nearly correct as can be determined in advance of the actual construction of the Work. The piping, equipment, ducts, etc. found to interfere with the construction of the building, plumbing apparatus and piping, electrical wiring or other obstructions, etc., must be changed in location to clear such obstructions.

C. The connections shown to the various units are intended as an indication only. The actual connections at the time of installation to be made and arranged as to fully and best suit the requirements of each particular case, adequately provide for expansion and perfect circulation and minimize the amount of space required for the same.

D. The Drawings show the general arrangement of all systems. Should local conditions necessitate rearrangement of one or more of the systems, CONTRACTOR, before proceeding with the Work, shall prepare and submit complete drawings showing all details of the proposed rearrangement for written approval by ENGINEER.

E. The Drawings do not show all offsets, fittings, accessories and details, which may be required. CONTRACTOR shall carefully examine all of the General Construction, Electrical, Mechanical, Structural and other Drawings and the respective Specifications for conditions which may affect the installation of the Work, and shall arrange the Work accordingly, furnishing all required items to meet such conditions which are not specified as work "by others," to complete the systems to the true extent of the Contract Documents.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Materials for piping system shall be specified under applicable Sections of Division 22, Plumbing.

2.2 PAINTING

A. All equipment and accessories shall be painted in accordance with the requirements of Section 09 91 00, Painting.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General:
   1. Install all items as shown, specified, and as recommended by the manufacturer.
   2. Request instructions from ENGINEER, in writing, when there is a conflict between the manufacturer's recommendations and the Contract Documents.
   3. Present conflicts to ENGINEER, in writing, who will determine corrective measures to be taken.
   4. Do not modify structures to facilitate installation of piping, unless specifically approved by ENGINEER.
   5. Installation to conform to requirements of all local and state codes.
   6. All connections between ferrous and non-ferrous piping materials shall be made with dielectric couplings.
   7. Properly plug or cap the open ends of all piping at the end of each day's Work or other stopping point through construction. Equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical damage.
   8. Provide shutoff valve, located for easy access, to each piece of equipment furnished.
   9. Provide drip pans below any plumbing piping passing over electrical panels or motor control centers. Drip pans shall be galvanized steel, 12-inch wider than the pipe it serves, 1-1/2-inch high lip all around and provided with a 1-inch drain line to spill to a drain outside of the protected area or to outside of the building.

B. Piping:
   1. Wherever changes in sizes of piping occur, changes shall be made with reducing fittings. The use of bushings is not permitted unless otherwise shown.
   2. All pipes passing through ceilings, floors and walls in finished rooms, and all supplies to fixtures shall have escutcheon plates.
   3. Install straight runs true to line and elevation.
   4. Install vertical piping tight to walls, columns and truly plumb leaving clearance for vertical supports only.
   5. Install piping parallel or perpendicular to building walls. Piping at odd angles and 45 degrees runs across corners will not be accepted unless specifically shown.
   6. Install small diameter piping generally as shown on the Drawings when specific locations and elevations are not indicated. Locate such piping as required to avoid ducts, equipment, beams, etc.
   7. Remove all cuttings and foreign matter from the inside of pipes and tubing before installation.
   8. Provide a union downstream of each valve with screwed connections.
   9. Use eccentric reducers where shown and where air or water pockets would otherwise occur in mains because of a reduction in pipe size.

C. Valves and Accessories:
   1. Provide supports for large valves, flow meters, and other heavy items as shown or otherwise required.
   2. Install floor stands as shown and as recommended by the manufacturer.
   3. Provide lateral restraints for extension bonnets and extension stems as shown and as recommended by the manufacturer.

3.2 FIELD QUALITY CONTROL

A. Field Tests:
   1. Fill all systems and fully test all equipment, valves, piping, etc. in operation.
   2. Check for excessive vibration while all systems are operating.
   3. Installed systems and components will not be released to DEPARTMENT or CITY unless all systems have been tested and approved by the ENGINEER.

B. Inspection:
   1. Examine areas to receive piping, valves and accessories for:
      a. Defects that adversely affect execution and quality of the Work.
      b. Deviations beyond allowable tolerances for piping, valves and accessories.
      c. Start the Work only when conditions are satisfactory.
   2. The ENGINEER reserves the right to reject or authorize replacement of piping and accessories found to be defective.

3.3 ADJUSTING AND CLEANING

A. Adjusting:
   1. While system is operable, balance all equipment, valves, etc. to achieve design conditions.

B. Cleaning:
   1. Thoroughly clean all piping, fittings, valves, and accessories prior to installation.
   2. Remove all dirt, rust, dust, etc. from piping in preparation for painting.
   3. Remove and dispose of all debris and waste from the Site resulting from installation.

3.4 MATERIAL SCHEDULES

A. Material Schedule shall be as specified under applicable Sections of Division 22, Plumbing.

+ + END OF SECTION + +

SECTION 22 10 63

TESTING OF PLUMBING PIPING SYSTEMS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified, and required to complete all testing of the plumbing piping systems.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before, the testing of plumbing piping systems Work.
   2. Notify other contractors in advance of the installation of the testing of plumbing piping systems to provide them with sufficient time for the installation of items included in their contracts that must be installed with, or before, the testing of plumbing piping systems Work.

C. Related Sections:
   1. Section 09 91 00, Painting.
   2. Section 22 11 16, Domestic Water Piping.
   3. Section 22 13 16, Sanitary Waste and Vent Piping.
   4. Section 22 18 00, Natural Gas Piping System.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. American National Standards Institute, (ANSI).
   2. American Society for Testing and Materials, (ASTM).
   3. Institute of Electrical and Electronics Engineers, (IEEE).
   4. National Electrical Code, (NEC).
   5. National Electrical Manufacturers' Association, (NEMA).
   6. National Fire Protection Association, (NFPA).
      a. NFPA 54, National Fuel Gas Code.
      b. NFPA 99, Standard for Health Care Facilities.
   7. Underwriters' Laboratories, Incorporated, (UL).

1.3 QUALITY ASSURANCE

A. Installer's Qualifications:
   1. Contractor regularly engaged in testing of plumbing piping systems and who agrees to employ only tradesmen with specific skill and experience in this type of Work. Submit name and qualifications to ENGINEER.

B. Regulatory Requirements: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
   1. American National Standards Institute, (ANSI).
   2. National Fire Protection Association, (NFPA).
   3. Underwriters' Laboratories, Incorporated, (UL).
   4. Local and State Building Codes and Ordinances.
   5. Permits: CONTRACTOR shall obtain and pay for all required permits, fees and inspections.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Product Data:
      a. Submit manufacturer's literature and samples for the valve tags.
   2. Testing Plans, Procedures, and Testing Limitations:
      a. Description of proposed testing method, procedures, and apparatus to the ENGINEER for approval at least 48 hours in advance of testing.

B. Informational Submittals: Submit the following:
   1. Site Quality Control Submittals:
      a. Submit a test report for each test to the ENGINEER certifying the test pressure, duration of test, and test performance of all installed piping.
   2. Qualifications Statements:
      a. Installer's qualifications.

PART 2 – PRODUCTS

2.1 GENERAL

A. Provide all necessary equipment and materials, including gages and pumps, to perform the testing operations.

2.2 VALVE TAGS

A. Manufacturers: Provide products of one of the following:
   1. Seton Name Plate Corporation.
   2. New York Stencil Works.
   3. Or equal.

B. Construction:
   1. Material: Brass.
   2. Size: 1-1/2-inch diameter.
   3. Chain: Brass.
   4. Lettering Size: 1/4-inch black filled letters over 1/2-inch high black filled numbers.

C. Legend:
   1. H.W. - Hot Water.
   2. C.W. - Cold Water.
   3. G - Gas.
   4. TW - Tepid Water.
   5. S - Sanitary

2.3 Valve Charts

A. General:
   1. Two required; 1/8-inch sheet acrylic in 8-1/2 by 11-inch extruded aluminum frame.
   2. Charts: Typed or inked on mylar with the following information for each valve.
      a. Valve identification number.
      b. Valve location.
      c. Valve use.
      d. Valve size.
      e. Manufacturer's name and model number.
   3. Submit sample valve tag with lettering.

PART 3 – EXECUTION

3.1 GENERAL

A. Conduct water, air, and smoke tests as required, on all piping systems as specified below.

B. Conduct all tests in the presence of, and in a manner approved by ENGINEER, all state and local authorities having jurisdiction. Repeat test for these authorities if requested by them.

C. Repair and retest all lines, which do not pass the tests as specified herein.

D. Inspect all valves, joints, and specialties for tightness and for proper operation while under test pressure.

E. Properly plug or cap the open ends of all piping at the end of each day's Work or other stopping point through the testing. Piping shall be tightly covered and protected against contamination.

3.2 FIELD QUALITY CONTROL

A. Water Tests:
   1. Drainage and Vent system piping:
      a. Perform tests either on the entire system or on successive sections of the system.

b. Tightly close all openings, except the highest opening of the system or section to be tested.
c. Fill the system or section with water to the point of overflow.
d. Test with a head of at least ten feet of water, except for the uppermost ten feet of the system.
e. Allow water to stand in the system for at least 15 minutes before inspecting.
f. Inspect the system or section for leaks, and repair any leaks found.

2. Water Piping:
   a. Water piping shall be tested and proved tight under a pressure not less than 1-1/2 times the working pressure under which it is to be used, but not less than 100 psig for 30 minutes with no loss of pressure.
   b. Potable water shall be used for testing potable water systems. Non-potable water shall be used for testing non-potable water systems.

B. Air Tests:
   1. Attach air compressor testing apparatus to any suitable opening after closing all other inlets and outlets. Force dehydrated oil-less compressed air, pressure dew point -40ºF, into system until there is a uniform gage pressure without the introduction of additional air. Below is a list of required gage pressures:
      a. Drainage and Vent Piping (substitute for water test): Five psi for 15 minutes.
      b. Vacuum System Piping: Test in accordance with the requirements of NFPA 99.
      c. Natural Gas Piping:
         1) All gas piping shall be tested under a pressure not less than 100 psig for a four-hour duration, regardless of working pressure. Duration time period to be measured after stabilization of the testing medium.
         2) All joints, fittings valves and other potential leak sources shall be swabbed with a leak detecting solution.
         3) A calibrated pressure gage having maximum increments of two psi shall be used.
         4) Only temporary weld-end dished-head caps or threaded-end caps, swell plugs or compression end caps (maximum 2-inch) are to be installed during pressure test operations.
         5) No compression couplings larger than 2-inches shall be included in the pressure test inside buildings pull-out from thrust forces. All piping shall be securely anchored or blocked to prevent movement or blowouts.
         6) Do not include meter, regulator and final service tee at main in leakage test. This equipment should be leak tested at service line pressure.
         7) All gas distribution piping shall be pressure tested in accordance with the requirements of the local municipal authorities and the local utility company, after compliance with the testing procedures set forth in this Section are met.

C. Smoke Tests:

1. Finished Plumbing: Final test for gas and water tightness of the completed drainage and vent system:
   a. Fill all traps with water.
   b. Introduce a pungent thick smoke, produced by one or more smoke machines, into the system.
   c. When the smoke appears at stack openings on the roof, close the system.
   d. Maintain a pressure in the system equivalent to a 1-inch water column for the period of the inspection.
   e. Inspect the system for leaks and repair any leaks found.

+ + END OF SECTION + +

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SECTION 22 11 16

DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified, and required to furnish and install domestic water and service water piping systems complete with accessories.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before, the domestic and service water piping systems Work.
   2. Notify other contractors in advance of installing domestic water heaters to provide other contractors with sufficient time for installing items included in their contracts to be installed with or before domestic water piping Work.

C. Related Sections:
   1. Section 09 91 00, Painting.
   2. Section 22 05 27, Pipe Sleeves for Plumbing.
   3. Section 22 05 29, Hangers and Supports for Plumbing Piping and Equipment.
   4. Section 22 05 93, Disinfection of Plumbing Systems.
   5. Section 22 07 19, Plumbing Piping Insulation.
   6. Section 22 10 53, Installation of Plumbing Piping.
   7. Section 22 10 63, Testing of Plumbing Piping Systems.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. ANSI A13.1, Scheme for Identification of Piping Systems.
   2. ANSI A21.1, Practice Manual, Computation Strength, Thickness.
   3. ANSI A21.4, Cement-Mortar Lining/Cast and Ductile Iron Pipe and Fittings (AWWA C105).
   4. ANSI A21.10, Cast-Iron and Ductile Iron Fittings, 2-inches through 48-inches, for Water (AWWA C110).
   5. ANSI A21.11, Rubber Gasket Joints for Cast-Iron and Ductile-Iron Pressure Pipe and Fittings (AWWA C111).
   6. ANSI A21.51, Ductile-Iron Pipe Centrifugally Cast, in Metal Molds (AWWA C151).
   7. ANSI A112.1.2, Air Gaps in Plumbing System.

8. ANSI B16.1, Cast-Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 150 and 800.
9. ANSI B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
10. ANSI B16.22, Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings (ASME B16.22).
11. ANSI B16.24, Cast Copper Alloy Pipe Flanges and Flanged Fittings, 150 and 300 lbs (ASME B16.24).
12. ANSI B16.26, Cast Copper Alloy Fittings for Flared Copper Tubes.
13. ANSI B16.39, Malleable Iron Threaded Pipe Unions.
14. ANSI B16.42, Ductile Iron Pipe Flanges and Flanged Fittings.
15. ANSI B40.1, Gages - Pressure Indicating Dial - Elastic Element.
16. ANSI H 23.1, Seamless Copper Water Tube, (ASTM B 88).
17. ANSI Z358.1, Emergency Eyewash and Shower Equipment.
18. American Society of Sanitary Engineers (ASSE), ASSE 1001, Performance Requirements for Atmospheric Type Vacuum Breakers.
19. ASSE 1013, Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers.
20. ASSE 1018, Trap Seal Primer Valves – Water Supply Fed.
21. ASSE 1020, Performance Requirements for Pressure Vacuum Breaker Assembly.
22. ASTM A 126, Specification for Gray Iron Casting for Valves, Flanges and Pipe Fittings.
23. ASTM A 307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
24. ASTM B 32, Specification for Solder Metal.
25. ASTM B 62, Specification for Composition Bronze or Ounce Metal Castings.
26. ASTM B 88, Specification for Seamless Copper Water Tube.
27. ASTM D 1330, Specification for Rubber-Sheet Gaskets.
28. AWWA C511, Reduced-Pressure Principle Backflow Prevention Assembly.
29. FS O-F-506, Flux, Soldering: Paste and Liquid.
30. FS WW-U-516, Unions, Brass or Bronze, Threaded Pipe Connections and Solder-Joint Tube Connections.
31. Plumbing and Drainage Institute (PDI), PDI WH 201, Water Hammer Arresters.

1.3 QUALITY ASSURANCE

A. Installer's Qualifications:
   1. Engage a single installer regularly engaged in domestic water piping installation and with experience in the installation of the types of materials required; and who agrees to employ only tradesmen with specific skill and experience in this type of Work. Submit name and qualifications to ENGINEER.
   2. Engage a single installer for the entire domestic water piping system with undivided responsibility for performance and other requirements.

B. Regulatory Requirements: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
   1 National Electrical Code, (NEC).
   2. Local and State Building Codes and Ordinances.

C. Component Supply and Compatibility:
   1. Obtain all equipment included in this Section regardless of the component manufacturer from a single domestic water piping systems manufacturer.
   2. The domestic water piping systems manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
   3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the domestic water piping systems manufacturer.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. 1/4-inch scale piping layouts, dimensioned to show length of piping runs, pipe sizes, support spacing and expansion provisions.
      b. Details of installation, including piping supports.
      c. Submit pipe schedule with laminate construction, sizes, thickness, vacuum pressure, weight per foot pressure, spans, joint type and flange data.
   2. Product Data:
      a. Manufacturer's literature, illustrations, specifications and engineering data.
      b. Flexible connections.
      c. Other technical data related to the specified material and equipment as requested by ENGINEER.
      d. Gasket material.

B. Informational Submittals: Submit the following:
   1. Qualifications Statements:
      a. Installer’s qualifications.

C. Project Closeout Submittals: Submit the following:
   1. Record Documentation:
      a. During progress of the Work keep an up-to-date set of the Drawings showing field and Shop Drawing modifications. Immediately upon completion of piping Work, submit CADD drawings showing the actual in place installation of all piping and equipment installed under this Section at a scale satisfactory to the CITY. The drawings shall reflect all of the piping Work on plans and in sections, with all reference dimensions and elevations required for complete Record Drawings of the piping systems. Two paper prints shall also be furnished. The prints and electronic copies of the CADD files shall be

furnished no later than 30 days after completion of the Contract and prior to final payment.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping Handling and Unloading:
   1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time to prevent delay of the Work.

B. Storage and Protection:
   1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
   2. Store all equipment in covered storage off the ground and prevent condensation and in accordance with the manufacturer's recommendations for long-term storage.

C. Acceptance at Site:
   1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify ENGINEER, in writing, if any loss or damage exists to equipment or components. Replace lost equipment or components and repair damage to new condition, in accordance with manufacturer's instructions.

1.6 GENERAL REQUIREMENTS

A. The Contract Documents show the general arrangement and extent of the Work to be completed. The exact location and arrangement of all parts shall be determined as the Work progresses. The exact location of all parts of the Work must be governed by the general building plans and the actual building conditions.

B. The Drawings show an indication of the arrangement of equipment, ducts, valves, etc., and are as nearly correct as can be determined in advance of the actual construction of the Work. Piping, equipment, ducts, etc. found to interfere with the construction of the building, plumbing apparatus and piping, electrical wiring or other obstructions, etc., must be changed in location to clear such obstructions, without additional cost to the DEPARTMENT.

C. The connections shown to the various units are intended as an indication only. The actual connections at the time of installation to be made and arranged to suit the requirements of each case, adequately provide for expansion and perfect circulation and minimize the amount of space required for the same.

D. The Drawings show the general arrangement of all systems. Should local conditions necessitate rearrangement of one or more of the systems,

CONTRACTOR, before proceeding with the Work, shall prepare and submit complete drawings showing all details of the proposed rearrangement for written approval by the ENGINEER.

E. The Drawings do not show, all offsets, fittings, accessories and details, which may be required. CONTRACTOR shall carefully examine all of the General Construction, Electrical, Mechanical, Structural and other Drawings and the respective Specifications for conditions which may affect the installation of the Work, and shall arrange the Work accordingly, furnishing all required items to meet such conditions which are not specified as work "by others", to complete the systems to the true extent of the Contract Documents.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. General:
   1. Materials and equipment indicated as being in contact with potable water or water that will be treated to become potable shall be certified and currently listed as suitable for contact with drinking water by an accredited certification organization in accordance with NSF/ANSI 61.

2.2 MATERIALS

1. Tube:
   a. References: ANSI H23.1, ASTM B 88.
   b. Type: K or L.
   c. Temper: Hard-drawn or soft-annealed.
2. Fittings:
   a. Reference: ANSI B16.22.
   b. Reference: ANSI B16.26.
   c. Reference: ANSI B16.18.
3. Joints:
   a. Sweat:
      1) Solder Metal: ASTM B 32, Type 95-5TA.
      2) Flux: FS O-F-506, Type 1.
   b. Flanged:
      1) Flanges: ANSI B16.24, 150 lb. class.
      2) Gaskets: Red rubber, ASTM D 1330, Grade 1, 1/8-inch thick.
      3) Nuts and Bolts: ASTM A 307.
4. Unions:
   a. Reference: FS WW-U-516.
   b. Material: Bronze.
   c. Rating: 250 lb. W.O.G.
5. Reference: NSF/ANSI 61-G.

B. Dielectric Couplings:
   1. Manufacturers: Provide products of one of the following:
      a. Watts Regulator Company.
      b. Epco Sales, Incorporated.
      c. Or equal.
   2. Type: Union or flange.
   3. Ratings:
      a. Unions: 250 psi, ANSI B16.39.
      b. Flanges: 175 psi, ANSI B16.42 (Iron), ANSI B16.24 (Bronze).
   4. Reference: NSF/ANSI 61-G.

2.3 VALVES

A. Bronze Body Globe Valves:
   1. Products and Manufacturers: Provide one of the following:
      a. Milwaukee Valve Product, Globe UP1502.
      b. Or equal.
   2. Type: Composition disc, union bonnet.
   3. Materials: Brass and bronze.
   4. Rating: 150 lb. SWP.
   5. End Connections: Solder joint.
   6. Reference: NSF/ANSI 61-G.

B. Bronze Body Check Valves:
   1. Products and Manufacturers: Provide one of the following:
      a. Stockham Valves and Fittings, Fig. No. LFB-309Y.
      b. Nibco, Fig. No. S-413-Y-LF.
      c. Or equal.
   2. Type: Swing, regrinding bronze disc, screw-in cap.
   3. Materials: Brass and bronze.
   4. Rating: 200 lb. CWP.
   5. End Connections: Solder joint.
   6. Reference: NSF/ANSI 61-G.

C. Bronze Body Ball Valves:
   1. Products and Manufacturers: Provide one of the following:
      a. Nibco, Fig. T-685- 80-LF.
      b. Milwaukee Valve Product. UPBA400.
      c. Or equal.
   2. Type: Non-blowout stem, adjustable packing gland, quarter turn, full port ball valve.
   3. Materials:
      a. Body: Cast bronze.
      b. Ball: Chrome plated brass.
      c. Packing and Seats: Teflon.
   4. Rating: 150 lb. SWP.
   5. End Connections: Screwed. Provide screwed to sweat adapters, where required.

6. Reference: NSF/ANSI 61-G.

D. Bronze Body Gate Valves:
1. Products and Manufacturers: Provide one of the following:
   a. Nibco, figure S-136.
   b. Or equal.
2. Type: Class 150, non-rising stem, solid wedge, union bonnet.
3. Materials: ASTM B 62 Bronze.
4. Rating: 150 psi SWP.
5. End Connections: Solder joint.
6. Reference: MSS SP-80.

E. Strainers:
1. Manufacturers: Provide products of one of the following:
   a. Mueller Steam Specialty Company
   b. Watts Regulator Company.
   c. Or equal.
2. Type: Self-cleaning wye body with blow-off cock.
3. Construction:
   a. Basket: Perforated stainless steel basket.
   b. Perforations: 0.045-inches diameter, minimum.
   c. Free Area: Four times, cross sectional area of connecting pipe, minimum.
4. Strainers 2-1/2-inch and smaller:
   a. Materials:
      1) Body: Cast bronze, ASTM B 62.
   b. Pressure Rating: 400 psi CWP at 150°F temperature.
   c. End Connections: Solder ends or screwed ends with adapters for screw to sweat ends.
   d. Blowoff Connection: Unplugged, NPT blowoff connection.
5. Strainers 3-Inches and larger:
   a. Construction:
      1) Body: Cast-iron, ASTM A 126.
   b. Pressure Rating: 125 psi steam.
   c. End Connections: Flanged ANSI B16.1 drilling.
   d. Blowoff Connections: Tapped, NPT, unplugged.
6. Provide short nipple and blowoff valve for each strainer.
7. Reference: NSF/ANSI 61-G.

F. Tepid Water Mixing Valve: TWMV:
1. Manufacturers: Provide products of one of the following:
   a. Powers, Model No. LFMM431.
   b. Leonard Water Temperature Controls, Model No. TM-5125-STSTL-EXP.
   c. Or equal.
2. Type: Thermostatically operated water-blending device.
3. Materials:
   a. Body: Brass.

b. Vanes: Brass.
c. Cabinet: Stainless steel.
4. Thermostatic element to be located in main body of valve.
5. Outlet dial thermometer.
6. Locking temperature regulator set at 85ºF.
7. Internal cold water bypass and temperature override protection.
8. Minimum Flow: 3 gpm.
9. Maximum Supply Pressure: 125 psi.
10. Maximum Supply Temperature: 180ºF.
11. References: ANSI Z358-1 and NSF/ANSI 61-G.

2.3 EQUIPMENT

A. Hose Bibbs, Pipe Drains: HB:
1. Products and Manufacturers: Provide one of the following:
a. Woodford Manufacturing Company, Model 24C.
b. Nibco, Incorporated, Fig. No. 74VB.
c. Or equal.
2. Valve:
a. Type: Indoor/non-freeze area boiler drain globe valve, chrome plated.
b. Materials: Bronze body, screwed bonnet, renewable composition disc.
c. End Connections: Hose thread outlet, male pipe thread or sweat inlet.
d. Rating: 125 lbs. WOG.
3. Vacuum Breaker:
a. Type: Non-removable, atmospheric.
b. Materials: Brass body, stainless steel trim, silicone rubber diaphragm and disc.
c. End Connections: Hose thread inlet and outlet.

B. Wall Hydrants: WH:
1. Exposed Hose Connection, Non-Freeze Type:
a. Products and Manufacturers: Provide one of the following:
1) Jay R. Smith, Fig. No. 5609-SE.
2) Zurn Industries, Fig. No. Z-1310.
3) Or equal.
b. Type: Anti-siphon, non-freeze wall hydrant.
c. Materials:
1) Casing: Bronze.
2) Vacuum Breaker: Integral.
3) Threads: Standard 3/4-inch hose thread outlet.
4) Wall Clamp: Adjustable with set screw.
5) Key: Removable tee handle type.
d. Connections: 3/4-inch sweat end inlet and 3/4-inch hose thread outlet, universal type.

C. Water Hammer Arresters:
1. Products and Manufacturers: Provide one of the following:
a. Hydrotrol by Jay R. Smith Manufacturing Company.

b. Shoktrol by Zurn Industries.
c. Or equal.

2. Materials:
a. Casing: Stainless steel.
b. Bellows: Stainless steel.
c. Bellows Contents: Nitrogen gas.

3. Connection: Male NPT thread.
4. Maximum Working Pressure: 250 psig.
5. Sizing and Certification: PDI WH 201.

D. Pipe Labels:
1. Type: Self-adhering, temperature resistant, waterproof, corrosion resistant.
2. Marker size, marker color, legend size, and legend color shall conform to ANSI A13.1.

E. Flexible Connections:
1. Manufacturers: Provide products of one of the following:
a. Flexonics, Incorporated.
b. Anaconda Metal Hose Division, Anamet, Incorporated.
c. Or equal.

2. Type: Flexible connections for piping 2-1/2-inches and smaller.
3. Construction:
a. Hose: Bronze.
b. Braid: Bronze.

4. Pressure Ratings: 190 psig working pressure at 250°F temperature.
5. End Connections: Solder end welded to hose and braid ends.

F. Automatic Air Vents:
1. Manufacturers: Provide products of one of the following:
a. Bell and Gossett.
b. Armstrong Pump Company.
c. Or equal.

2. Type: Automatic vent air eliminator with built-in air chamber.
3. Construction:
a. Body: Bronze.
b. Finish: Chrome plated exterior.
c. Overflow Connector: Provide connection for 1/4-inch OD copper tubing.

4. Ratings: 75 psig working pressure.

G. Thermometers:
1. Manufacturers: Provide products of one of the following:
a. Weksler Instrument Company.
b. H.O. Trerice Company.
c. Or equal.

2. Range: 30°F to 240°F temperature range in maximum of 2°F increments.
3. Type: Adjustable Angle Column Type Thermometer.
a. Construction:

1) Scales and Lens: Nine-inch high satin finish aluminum scales, black numerals, front red reading mercury tubes.
2) Wells: Insertion well with brass separable sockets.
3) Neck: 2-1/2-inch extension neck.
4) Case: Cast aluminum with bronze finish.
5) Window: Glass or clear acrylic plastic.

H. Pressure Gages:
1. Manufacturers: Provide products of one of the following:
   a. Weksler Instrument Company.
   b. H.O. Trerice Company.
   c. Or equal.
2. Reference ANSI B40.1 for Grade AA gages.
3. Type: Direct mounted, dial type pressure gage.
4. Construction:
   a. Case: Six-inch diameter cast aluminum, flangeless with black finish and bottom 1/4-inch N.P.T.
   b. Ring: Chrome plated close type.
   c. Dial: White face, black numbers and graduations.
   d. Window: Glass or clear acrylic plastic.
   e. Pointer: Micrometer type, black finish, red tip.
   f. Movement: Stainless steel, rotary type, delrin sector and bushings.
   g. Bourdon Tube: Seamless phosphor bronze, Grade A over pressured and stress relieved.
   h. Socket and Tip: Forged brass, alloy steel and Type 316 stainless steel.
5. Accuracy: One percent minimum.
6. Gage Cocks: Provide brass tee handle isolation cock before each gage.

I. Backflow Preventers: 1/2-Inch to 2-Inches: RPZ-BFP:
1. Products and Manufacturers: Provide one of the following:
   a. Febco, Model 825Y.
   b. Watts Regulator Company, Series 909.
   c. Or equal.
2. Type: Reduced pressure zone device with two independently acting check valves, together with an automatically operated pressure differential relief valve located between the two check valves.
3. Materials:
   a. Body: Bronze.
   b. Valve Discs: BUNA-N rubber.
   c. Diaphragm: Silicone rubber or Buna-N rubber.
   d. Springs: Stainless steel.
   e. Screws: Stainless steel.
4. Maximum Working Pressure: 150 psi.
5. End Connections: Screwed.
6. Accessories:
   a. Air gap drain funnel with threaded outlet and vent elbow furnished by manufacturer.
   b. Strainer with blow-off on inlet.

c. Ball valves on inlet and outlet.
d. Reduced pressure principle backflow preventer test kit for each unit furnished, provided in molded plastic carrying case with foam inserts.

7. References: ASSE 1013, AWWA C511 and authority having jurisdiction at the Site.

J. Vacuum Breakers:
1. Pressure Type: PVB:
a. Products and Manufacturers: Provide one of the following:
1) Watts Regulator Company, No. 800.
2) Conbraco Industries, Incorporated, Series 40-500.
3) Febco, Model 765.
4) Or equal.
b. Type: An assembly containing an independently operating internally loaded check valve and an independently operating loaded air inlet valve located on the discharge side of the check valve. The assembly shall also be equipped with test cocks and shut off valves on the inlet and outlet of the assembly.
c. Materials:
1) Hood: Stainless steel.
2) Bonnet: Bronze.
3) Vent Disc: Silicone rubber.
4) Disc Holder Float: Polyethylene.
5) Check Valve Disc: Silicone rubber.
6) Check Valve Seat: Bronze.
7) Body: Bronze.
d. Accessories:
1) Ball valves on inlet and outlet on the assembly.
2) Ball valve test cocks on the assembly.
e. Reference: ASSE 1020.
f. Working Pressure: 150 psi.
g. Installation: Vertical, minimum 12-inches above fixture vacuum breaker serves.
2. Atmospheric Type: AVB:
a. Products and Manufacturers: Provide one of the following:
1) Watts Regulator Company, No. 288A.
2) Conbraco Industries, Incorporated, Series 38.
3) Febco, Model 710/715, as required.
4) Or equal.
b. Type: An assembly containing an air inlet valve, a check seat and an air inlet port to prevent reverse flow of water and allow air into the water line to break a siphon.
c. Materials:
1) Hood: Bronze.
2) Body: Bronze.
3) Vent Disc: Silicone.
4) Disc Holder Float: Polyethylene.
5) Body: Bronze.

d. Reference: ASSE 1001.
e. Working Pressure: 210°F at 125°F.
f. Installation: Vertical, minimum 6-inches above fixture vacuum breaker serves.

K. Emergency Shower and Eyewash Stations:
1. Emergency Shower and Eyewash (Corrosion Resistant): EES:
a. Products and Manufacturers: Provide one of the following:
1) Haws Drinking Faucet Company, Model No. 8336.
2) Speakman Company, Model SE-690-PVC.
3) Or equal.
b. Type: Free standing corrosion resistant emergency shower and eyewash combination station.
c. Materials:
1) Shower: Nine-inch diameter cycolac plastic showerhead with 1-1/2-inch stay-open stainless steel ball valve and 24-inch rigid pull rod.
2) Eye/Face-Wash: Cycolac bowl with twin Buna-N covered ABS heads and stainless steel ball valve, stay open type.
3) Pipe: All PVC parts shall be Schedule 80, painted safety yellow.
4) Supply: 1-1/4-inch PVC.
2. Flow Switches, Audible and Visible Alarms:
a. Manufacturers: Provide products of one of the following:
1) Haws Drinking Faucet Co.
2) Speakman Company.
3) Or equal.
b. Type: Single pole, double throw, NEMA 4X, UL listed paddle type flow switch. Contacts to be rated for five amps at 120 VAC.
c. Flow switches shall be furnished by the emergency shower and eyewash stations manufacturer to ensure compatibility and proper sensing of flows from shower, eyewash or combination of the two flows from a combination station. CONTRACTOR shall assume complete responsibility for the proper operation of the flow sensing of the eyewash and shower units if flow switches other than furnished or recommended by the emergency shower and eyewash stations manufacturer may be used.
d. Flow switch in a combination station shall sense flow for either shower or eyewash or combination of the two flows. Flow switches shall be full line size so as not restrict water flow in order to detect flow. Each individual shower station, eyewash station and combination station shall be equipped with individual flow switch.
e. Visible alarm shall be an amber flashing light, UL listed.
f. Audible alarm shall be an intermittent signal rated at 85 dB at ten feet.
g. Each shower shall be furnished with a shower and eyewash test kit.
h. Coordinate electrical wiring and connection of flow switches and audible and visible alarms with Division 26, Electrical.
3. Safety Valve Lockout with Padlock:
a. Heavy-duty plastic, dielectric and chemical resistant valve lock.

b. Padlock with unique serial number, hardened steel shackle, and two brass keys with matching serial numbers for each padlock.
c. Manufacturers: Provide products of one of the following:
1) Akron, Safety Products, Inc.
2) Brady USA, Inc.
3) Or equal.

4. Anti-Scald Valves:
a. Anti-scald valve provides scald protection and bleeds valve whenever internal temperature rises above 100°F and closes when line temperature drops to 85°F.
b. Products and Manufacturers: Provide one of the following:
1) Haws Drinking Faucet Company, Model SP157A scald-protection valve.
2) Speakman Company.
3) Or equal.

L. Hose Reels: HR:
1. Products and Manufacturers: Provide one of the following:
a Croker-Standard, Fig. No. 7025.
b. Potter Roemer, Incorporated, Fig. No. 2838.
c. Or equal.
2. Type: Continuous flow hose reel.
3. Materials:
a. Rims: Tubular steel, welded.
b. Spokes: 3/8-inch diameter steel rods.
c. Frame: Heavy steel bar frame.
d. Drum: Galvanized steel.
e. Finish: Baked enamel.
f. Connections: One-inch inlet and outlet.
g. Threads: One-inch N.S.T.

M. Hose Nozzles:
1. Products and Manufacturers: Provide one of the following:
a. Croker-Standard, Fig. No. 3477.
b. Potter Roemer, Incorporated, Fig. No. 2959.
c. Or equal.
2. Materials:
a. Body: Lexan.
b. Stem: Brass.
c. Bumper: Rubber.
3. Threads: One-inch N.S.T.
4. Nozzle: Adjustable fog nozzle, capable of complete shut-off, solid straight stream, or any degree of solid conical fog.

N. Hose:
1. Products and Manufacturers: Provide one of the following:
a. Croker-Standard, Fig. No. 7037 with brass coupling for non-collapsible hose.

b. Potter Roemer, Fig. No. 2852 hose with Fig. No. 2862 coupling.
c. Or equal.

2. Type: Double braided synthetic hose for use with continuous flow reels to permit flow while hose is coiled on reel. Couplings shall connect to hose nozzle threads and male hose outlet threads on hose reel.
3. Threads: One-inch N.S.T.
4. Hose Size: One-inch.
5. Length: 100 feet, one continuous length as shown with no intermediate couplings.

O. Quick Coupler Connections:
1. Products and Manufacturers: Provide one of the following:
a. Dover Corporation; OPW "Kamlok" 633 series.
b. Or equal.
2. Type: Cam arms lock into adaptor groove.
3. Materials: Adaptor and Coupler:
a. Body: Stainless steel.
b. Cam Arms: Stainless steel.
c. Gaskets: Buna N.
4. End Connections: Socket weld quick connect adaptor for connection to copper tubing; hose shank quick connect coupler.
5. Reference: MIL-C-27487.

P. Trap Primer Valve:
1. Manufacturers: Provide products of one of the following:
a. Precision Plumbing Products, Model P1-500.
b. Watts.
c. Or equal.
2. Construction:
a. Body: Brass.
b. Seals: O-ring 40°F to 450°F.
c. Inlet and Outlet Size: 1/2-inch.
d. Integral backflow preventer.
e. Provide multiple outlet distribution units.
f. Reference: ASSE 1018.
g. Accessories: Floor drain trap primer distribution unit.

Q. Hot Water Temperature Maintenance Heat Tracing:
1. Manufacturers: Provide products of one of the following:
a. Thermon Manufacturing Company.
b. Tyco Thermal Controls.
c. Chromalox.
2. General: All hot water piping from the domestic hot water heater to plumbing fixtures shall be provided with a hot water temperature maintenance heat tracing system. Furnish, install and tests a complete UL listed system of heat trace cable(s) and components approved and designed specifically for maintaining hot water and tepid water in a domestic hot water system at selected temperatures of 140ºF for hot water and 85ºF for tepid water. All

piping as specified below shall be electrically traced with self-limiting heaters. Adjustable control thermostats, to maintain a constant water temperature for the tepid water heat tracing system shall be provided as recommended by the manufacturer.

a. All hot water piping from the domestic hot water heater to tepid water mixing valves shall be maintained to a temperature of 140ºF.
b. All tepid water piping from the tepid water mixing valves to emergency showers and eyewash stations shall be maintained to a temperature of 85ºF.

3. Manufacturer shall assist in selecting the correct tracer and developing a recommended Bill of Materials. All components of the systems shall be a product of one manufacture. All connections and equipment shall be moisture-proof.
4. The heater cable assembly shall consist of two No. 14 AWG parallel nickel-plated copper bus wires imbedded in a self-regulating core and covered in a cross-linked polyolefin insulating jacket. The heater assembly shall be covered with tinned copper metallic braid and an outer jacket of cross-linked polyolefin insulation, nominally of 40-mil thickness, and color-coded for easy identification.
   a. Provide electric heat trace cables equal to the following Thermon products:
      1) Hot Water System: (140 ºF): HSX 2105 (Red).
      2) Tepid Water System: HSX 2105 (Blue) fitted with adjustable control Thermostat equal to E4X-25325.
5. The cables shall be rated for 120 or 208 Volt operation.
6. Pipe and heat trace shall be insulated with 1-1/2-inch thick fiberglass insulation as described in Section 22 07 19, Plumbing Piping Insulation.
7. Provide a NEMA 4X rated splicing power-to-tracing connectors or kits and required electrical equipment enclosures for all the buildings and areas except for the Administration Building, which shall be NEMA 4 rated. The heat trace cable shall be furnished complete with all necessary power connectors, thermostats, end terminations, splice kits, straps, ground fault circuit breakers, junction boxes, etc., as required. Coordinate required power supplies and connection with Division 26, Electrical.
8. Perform required cable test in accordance with manufacturer's instructions and recommendations.

2.4 PAINTING

A. Piping and accessories shall be painted in accordance with Section 09 91 00, Painting.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General:
   1. Install all items as shown, specified, and as recommended by the manufacturers.
   2. Request instructions from ENGINEER, in writing, when there is a conflict between the manufacturer's recommendations and the Contract Documents.
   3. Present conflicts between piping systems and/or equipment and/or structures to ENGINEER, in writing, who will determine corrective measures to be taken.
   4. Do not modify structures to facilitate installation of piping, unless specifically approved by ENGINEER.
   5. Installation of piping shall conform to requirements of all local and state codes.
   6. Installation of piping shall be in accordance with Section 22 10 53, Installation of Plumbing Piping and local water utility company.
   7. Installation of hangers and supports shall be in accordance with Section 22 05 29, Hangers and Supports for Plumbing and Piping Equipment.
   8. Installation of pipe sleeves shall be in accordance with Section 22 05 27, Pipe Sleeves for Plumbing.
   9. Install piping insulation in accordance with Section 22 07 19, Plumbing Piping Insulation.
   10. Properly plug or cap the open ends of all piping at the end of each day's Work or other stopping point through construction. Equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical damage.

3.2 FIELD QUALITY CONTROL

A. Field Tests:
   1. Test all piping in accordance with Section 22 10 63, Testing of Plumbing Piping Systems.
   2. Fill all systems and fully test all equipment, valves, dampers, etc. in operation.
   2. Check for excessive vibration while all systems are operating.
   3. Installed systems and components will not be released to DEPARTMENT or CITY, unless all systems have been tested and approved by the ENGINEER.

B. Inspection:
   1. Examine areas to receive piping, valves and accessories for:
      a. Defects that adversely affect execution and quality of the Work.
      b. Deviations beyond allowable tolerances for piping, valves and accessories.
      c. Start the Work only when conditions are satisfactory.

2. The ENGINEER reserves the right to reject or authorize replacement of piping and accessories found to be defective.

3.3 ADJUSTING AND CLEANING

A. Adjusting:
   1. Adjust all controls for proper settings.
   2. While system is operable balance all equipment, valves, dampers, etc. to achieve design conditions.

B. Cleaning:
   1. Thoroughly clean all piping, fittings, valves, and accessories prior to installation.
   2. Remove all dirt, rust, dust, etc. from piping in preparation for painting.
   3. Disinfection of piping and equipment shall be in accordance with Section 22 05 93, Disinfection of Plumbing Systems.
   4. Remove and dispose of all debris and waste from the Site resulting from installation.

3.4 MATERIAL SCHEDULES

A. Piping:
   1. Use types of pipe and fittings as specified below, unless otherwise specified or shown.
   2. All potable water supply, hot, cold and tepid water piping 2-1/2-inches and smaller, run within the interior of a building, shall be hard-drawn copper Type “L” with solder joints and connections.
   3. All potable and service water piping 2-1/2-inches and smaller run underground shall be soft-annealed copper Type “K” copper tubing.
   4. All exposed water piping and valves to plumbing fixtures shall be chrome-plated brass.
   7. All valves for copper or brass piping shall be bronze bodied, unless otherwise specified.
   8. Use “wrought copper” fittings for copper tubing.
   9. Use “butt welded” fittings for welded steel pipe connections.

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SECTION 22 13 16

SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified, and required to furnish and install sanitary waste and vent piping systems complete with accessories.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before, the sanitary waste and vent piping systems Work.
   2. Notify other contractors in advance of the installation of the sanitary waste and vent piping systems to provide them with sufficient time for the installation of items included in their contracts that must be installed with, or before, the sanitary waste and vent piping systems Work.

C. Related Sections:
   1. Section 09 91 00, Painting.
   2. Section 22 05 27, Pipe Sleeves for Plumbing.
   3. Section 22 05 29, Hangers and Supports for Plumbing Piping and Equipment.
   4. Section 22 10 53, Installation of Plumbing Piping.
   5. Section 22 10 63, Testing of Plumbing Piping Systems.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. American National Standards Institute, (ANSI).
      a. ANSI B16.12, Cast-Iron Threaded Drainage Fittings.
      b. ANSI B125.2, Black/Hot-Dipped Zinc Coated Welded/Seamless Pipe.
   2. American Society of Sanitary Engineering, (ASSE).
   3. American Society for Testing and Materials, (ASTM).
      a. ASTM A 74, Specification for Cast-Iron Soil Pipe and Fittings.
      b. ASTM A 518/A 518M, Specification for Corrosion-Resistant High-Silicon Iron Castings.
      c. ASTM A 861, Specification for High-Silicon Iron Pipe and Fittings.
      d. ASTM A 888, Specification for Hubless Cast-Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications.
      e. ASTM C 564, Specification for Rubber Gaskets for Cast-Iron Soil Pipe and Fittings.

f. ASTM D 1785, Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120.
g. ASTM D 2665, Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste and Vent Pipe and Fittings.

4. Cast-Iron Soil Pipe Institute, (CISPI).
   a. CISPI 310 Specification for Couplings for Use in Connection with Hubless Cast-Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications.
   b. CISPI HSN, Specification for Neoprene Rubber Gaskets for Hub and Spigot Cast-Iron Soil Pipe and Fittings.
5. Federal Specifications, (FS).
   a. FS QQ-C-40, Calking Lead Wool and Lead Pig.

1.3 QUALITY ASSURANCE

A. Installer's Qualifications:
   1. Engage a single installer regularly engaged in sanitary piping installation and with experience in the installation of the types of materials required; and who agrees to employ only tradesmen with specific skill and experience in this type of Work. Submit name and qualifications to ENGINEER.
   2. Engage a single installer for the entire sanitary waste and vent piping system with undivided responsibility for performance and other requirements.

B. Regulatory Requirements: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
   1. National Sanitary Foundation, (NSF).
   2. Local and State Building Codes and Ordinances.
   3. Permits: CONTRACTOR shall obtain and pay for all required permits, fees and inspections.

C. Component Supply and Compatibility:
   1. Obtain all equipment included in this Section regardless of the component manufacturer from a single sanitary waste and vent piping systems manufacturer.
   2. The waste and vent piping systems manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
   3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the sanitary waste and vent piping systems manufacturer.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. 1/4-inch scale piping layouts, dimensioned to show length of piping runs, pipe sizes, support spacing and expansion provisions.
      b. Details of installation, including piping supports.

c. Submit pipe schedule with laminate construction, sizes, thickness, vacuum pressure, weight per foot pressure, spans, joint type and flange data.

2. Product Data:
   a. Manufacturer's literature, illustrations, specifications and engineering data.
   b. Flexible connections.
   c. Other technical data related to the specified material and equipment as requested by ENGINEER.
   d. Gasket material.

B. Informational Submittals: Submit the following:
   1. Qualifications Statements:
      a. Installer's Qualifications

C. Record Documentation: Submit the following:
   1. Record Drawings:
      a. During progress of the Work keep an up-to-date set of the Drawings showing field and Shop Drawing modifications. Immediately upon completion of piping Work, submit CADD drawings showing the actual in place installation of all piping and equipment installed under this Section at a scale satisfactory to the CITY. The drawings shall reflect all of the piping Work on plans and in sections, with all reference dimensions and elevations required for complete Record Drawings of the piping systems. Two paper prints shall also be furnished. The prints and electronic copies of the CADD files shall be furnished no later than 30 days after completion of the Contract and prior to final payment.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:
   1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time to prevent delay of the Work.

B. Storage of Materials:
   1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
   2. Store all equipment in covered storage off the ground and prevent condensation and in accordance with the manufacturer's recommendations for long-term storage.

C. Acceptance at Site:
   1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify ENGINEER, in writing, if

any loss or damage exists to equipment or components. Replace lost equipment or components and repair damage to new condition, in accordance with manufacturer's instructions.

1.6 GENERAL REQUIREMENTS

A. The Contract Documents show the general arrangement and extent of the Work to be completed. The exact location and arrangement of all parts shall be determined as the Work progresses. The exact location of all parts of the Work must be governed by the general building plans and the actual building conditions.

B. The Drawings show an indication of the arrangement of equipment, piping, valves, etc., and are as nearly correct as can be determined in advance of the actual construction of the Work. Piping, equipment, etc., found to interfere with the construction of the building, plumbing apparatus and piping, electrical wiring or other obstructions, etc., must be changed in location to clear such obstructions.

C. The connections shown to the various units are intended as an indication only. The actual connections at the time of installation to be made and arranged to suit the requirements of each case and adequately provide for expansion and perfect circulation and minimize the amount of space required for the same.

D. The Drawings show the general arrangement of all systems. Should local conditions necessitate rearrangement of one or more of the systems, CONTRACTOR, before proceeding with the Work, shall prepare and submit complete drawings showing all details of the proposed rearrangement for written approval by the ENGINEER.

E. The Drawings do not show all offsets, fittings, accessories and details, which may be required. CONTRACTOR shall carefully examine all of the General Construction, Electrical, Mechanical, Structural and other Drawings and the respective Specifications for conditions which may affect the installation of the Work, and shall arrange the Work accordingly, furnishing all required items to meet such conditions which are not specified as work "by others", to complete the systems to the true extent of the Contract Documents.

PART 2 - PRODUCTS

2.1 PIPING

A. Cast-Iron Soil Pipe and Fittings:
   1. Pipe and Fittings: ASTM A 74.
   2. Weight: Service Weight.
   3. Joints:
      a. Compression:
         1) Gasket: Neoprene Rubber, ASTM C 564, CISPI HSN.

2) Lubricant: As recommended by pipe manufacturer.

b. Calked:

1) Lead: FS QQ-C-40, Type I, Grade AA.

2) Jute Packing: FS HH-P-117, Type I.

B. Steel Pipe and Fittings:

1. Pipe: ANSI B125.2.
2. Weight: Schedule 40.
3. Finish: Galvanized.
4. Fittings: ANSI B16.12 recessed drainage pattern galvanized cast-iron, threaded so as to allow 1/8-inch or 1/4-inch per foot grade, as required.

C. Hubless Cast-Iron:

1. No-Hub Pipe and Fittings: ASTM A 888.
2. Joints: CISPI 310.

D. Polyvinyl Chloride Pipe and Fittings:

1. Pipe: ASTM D 1785, Type 2110.
2. Weight: Schedule 40.
3. Fittings: ASTM D 2665, drainage type.
4. Joints: Solvent weld with manufactures recommended solvents.

2.2 DRAINS AND CLEANOUTS

A. Drains:

1. Floor Drain, Funnel Drain: (FD-1).

a. Products and Manufacturers: Provide one of the following:

1) Jay R. Smith, Fig. 3665.

2) Zurn Industries, Fig. Z-526 with Z-329, 9-inch.

3) Or equal.

b. Type: Medium-duty funnel drain.

c. Materials:

1) Body: Enameled cast-iron.

2) Collar: Enameled cast-iron.

3) Top: Enameled cast-iron, adjustable, 12-inch diameter, minimum.

4) Grate: Cast-iron.

5) Funnel: Cast-iron, oval.

d. Accessories:

1) Sediment bucket.

2) Vandal proof.

e. Rating: Medium-duty.

f. Outlet Connection: Bottom outlet, calk or no-hub, as required.

g. Floor drains shall be coated with an acid resistant coating.

2. Floor Drain, General Purpose: (FD-2).

a. Products and Manufacturers: Provide one of the following:

1) Jay R. Smith, Fig. 2340.

2) Zurn Industries, Fig. Z-521.

3) Or equal.

b. Materials:
   1) Body: Enameled cast-iron.
   2) Collar: Enameled cast-iron.
   3) Top: Enameled cast-iron adjustable.
   4) Grate: Ductile iron, 11-1/2-inch diameter.
c. Accessories: Sediment bucket.
d. Rating: Heavy-duty.
e. Outlet Connection: Bottom outlet, calk or no-hub, as required.
f. Floor drains shall be coated with an acid resistant coating.
g. Trap primer connection on body with thread to solder adapter, as required.

B. Cleanouts:
1. Cleanout Deck Plates (FCO-1):
   a. Products and Manufacturers: Provide one of the following:
      1) Jay R. Smith, Fig. 4040.
      2) Zurn Industries, Fig. No. Z-1400-3.
      3) Or equal.
   b. Materials: Cast-iron body and adjustable nickel bronze top.
   c. Outlet Connection: Standard spigot.
   d. Accessories:
      1) Square nickel bronze top.
      2) Cast bronze taper thread plug.
2. Wall Cleanout Plate (WCO):
   a. Products and Manufacturers: Provide one of the following:
      1) Jay R. Smith, Fig. 4402.
      2) Zurn Industries, Fig. No. Z-1441.
      3) Or equal.
   b. Materials: Cast bronze taper thread plug.
   c. Accessories:
      1) Stainless steel round shallow wall plate.
      2) Cast-iron calked ferrule.

C. Neutralization Tank:
1. Products and Manufacturers: Provide one of the following:
   a. Enfield Industrial Corporation, Neutratank, T Style.
   b. Orion Industries, Incorporated, Style 5, Model No. 505A.
   c. Or equal.
2. Materials:
   a. Tank: High density polyethylene.
   b. Cover: Polyethylene, bolt down.
   c. Gasket: Neoprene.
   d. Nuts, Bolts and Washers: Type 316 stainless steel.
3. Connections:
   a. Inlet: 2-inch.
   b. Outlet: 2-inch.
   c. Vent: 2-inch.
4. Capacity: Five gallon nominal.

5. Approximate Pounds of Limestone Chips: 50 pounds.
6. Wall Thickness: 3/16-inch, minimum.
7. Fill with limestone or marble chips one to three inches in size to a level just below tank outlet.

2.3 PAINTING

A. All piping and accessories shall be painted in accordance with the requirements of Section 09 91 00, Painting.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General:
   1. Install all items as shown, specified, and as recommended by the manufacturer.
   2. Request instructions from ENGINEER, in writing, when there is a conflict between the manufacturer's recommendations and the Contract Documents.
   3. Present conflicts to ENGINEER, in writing, who will determine corrective measures to be taken.
   4. Do not modify structures to facilitate installation of piping, unless specifically approved by ENGINEER.
   5. Installation shall conform to requirements of all local and state codes.
   6. Installation of piping shall be in accordance with Section 22 10 53, Installation of Plumbing Piping.
   7. Installation of hangers and supports shall be in accordance with Section 22 05 29, Hangers and Supports for Plumbing and Piping Equipment.
   8. Installation of pipe sleeves shall be in accordance with Section 22 05 27, Pipe Sleeves for Plumbing.
   9. Protection: Properly plug or cap the open ends of all piping at the end of each day's Work or other stopping point through construction. Equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical damage.

3.2 FIELD QUALITY CONTROL

A. Field Tests:
   1. Tests: Water or smoke test piping in accordance with Section 22 10 63, Testing of Plumbing Piping Systems.
   2. Fill all systems and fully test all equipment, valves, etc. in operation.
   3. Check for excessive vibration while all systems are operating.
   4. Installed systems and components will not be released to OWNER, unless all systems have been tested and approved by the ENGINEER.

B. Inspection:
   1. Examine areas to receive piping, valves and accessories for:
      a. Defects that adversely affect execution and quality of the Work.
      b. Deviations beyond allowable tolerances for piping, valves and accessories.
      c. Start the Work only when conditions are satisfactory.
   2. The ENGINEER reserves the right to reject or authorize replacement of piping and accessories found to be defective, blistered, cracked or deviated from allowable tolerances as described above.

3.3 ADJUSTING AND CLEANING

A. Adjusting:
   1. While system is operable, balance all equipment, valves, etc. to achieve design conditions.

B. Cleaning:
   1. Thoroughly clean all piping, fittings, valves, and accessories prior to installation.
   2. Remove all dirt, rust, dust, etc. from piping in preparation for painting.
   3. Remove and dispose of all debris and waste from the Site resulting from installation.

3.4 MATERIAL SCHEDULES

A. Piping:
   1. Use types of pipe and fittings as specified below, unless otherwise specified or shown.
   2. All exposed gravity sanitary waste and vent piping run within the interior of a building shall be no-hub cast-iron.
   3. All gravity sanitary waste and vent piping located in concrete slabs or underground to exterior limits as shown shall be cast-iron soil pipe.
   4. All chemical waste and vent piping from receptors and other fixtures to the neutralizing tank shall be Schedule 40 PVC piping.

++ END OF SECTION ++

SECTION 22 18 00

NATURAL GAS PIPING SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified, and required to furnish and install natural gas piping system complete with accessories.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before, the gas piping systems Work.
   2. Notify other contractors in advance of the installation of the gas piping system to provide them with sufficient time for the installation of items included in their contracts that must be installed with, or before, the gas piping systems work.

C. Related Sections:
   1. Section 09 91 00, Painting.
   2. Section 22 05 27, Pipe Sleeves for Plumbing.
   3. Section 22 05 29, Hangers and Supports for Plumbing Piping and Equipment.
   4. Section 22 10 53, Installation of Plumbing Piping.
   5. Section 22 10 63, Testing of Plumbing Piping Systems.
   6. Section 31 23 05, Excavation and Fill.

D. Work included in this Contract but specified elsewhere:
   1. Anchorage systems shall comply with Section 05 05 33, Anchor Systems.
   2. Shop painting and surface preparation shall comply with Section 09 91 00, Painting, unless otherwise specified in Division 26 Sections.
   3. Excavation and filling associated with buried electrical Work shall comply with Section 31 23 05.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. American National Standards Institute, (ANSI).
      a. ANSI A13.1, Scheme for Identification of Piping Systems.
      b. ANSI B125.2, Black/Hot-Dipped Zinc Coated Welded/Seamless Pipe.
   2. American Society for Testing and Materials, (ASTM).
      a. ASTM A 53/A 53M, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
      b. ASTM B 88, Specification for Seamless Copper Tube.

3. National Fuel Gas Code, NFPA 54.
4. International Fuel Gas Code, (IFGC).

1.3 QUALITY ASSURANCE

A. Installer's Qualifications:
   1. Engage a single installer regularly engaged in gas piping installation and with experience in the installation of the types of materials required; and who agrees to employ only tradesmen with specific skill and experience in this type of Work. Submit name and qualifications to ENGINEER.
   2. Engage a single installer for the gas piping system with undivided responsibility for performance and other requirements.
   3. All welding shall be performed in accordance with ANSI B31.1, ANSI B31.8 and AWWA C206 except as modified or supplemented herein. All welders shall be AWS certified in accordance with AWWA C206, and ANSI B31.1 requirements. Welders shall have their current certificate available for the ENGINEER's inspection.
      a. Each welder shall be required to identify his weld with his specific code marking signifying his name and assigned number.
      b. For piping systems with service temperatures in excess of 120 degrees Fahrenheit, each welder shall be examined at the job site by the CONTRACTOR in the presence of the ENGINEER to determine the ability of the welder to meet the qualifications required. Welders shall be tested for all positions including welds with the axis horizontal (not rolled) and with the axis vertical. Each welder shall be allowed to weld only in the position in which he has qualified. It shall be the CONTRACTOR's responsibility to assign only the site tested welders to this piping.
      c. When a welder fails to meet the prescribed welding qualifications and/or fails an on-site examination, or is responsible for a defective weld, that welder shall be retested on the job site. If he fails a second on-site examination he shall be disqualified for work on the project.
   4. Visually inspect welding while the operators are making the welds and again after the work is completed. After the welding is completed, hand or power wire brush welds and clean them before the inspector makes the check inspection. Inspect welds under light for surface cracking, porosity, and slag inclusions, excessive roughness, unfilled craters, gas pockets, undercuts, overlaps, size, and insufficient throat and concavity.

B. Regulatory Requirements: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
   1. American National Standards Institute, (ANSI).
   2. American Society of Mechanical Engineers, (ASME).
   3. National Fire Protection Association, (NFPA).
   4. Underwriters' Laboratories, Incorporated, (UL).
   5. Local and State Building Codes and Ordinances.
   6. Permits: CONTRACTOR shall obtain and pay for all required permits, fees and inspections.

C. Component Supply and Compatibility:
   1. Obtain all equipment included in this Section regardless of the component manufacturer from a single gas piping system manufacturer.
   2. The gas piping systems manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
   3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the gas piping systems manufacturer.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. 1/4-inch scale piping layouts, dimensioned to show length of piping runs, pipe sizes, support spacing and expansion provisions.
      b. Details of installation, including piping supports.
      c. Submit pipe schedule with laminate construction, sizes, thickness, vacuum pressure, weight per foot pressure, spans, joint type and flange data.
   2. Product Data:
      a. Manufacturer's literature, illustrations, specifications and engineering data.
      b. Flexible connections.
      c. Other technical data related to the specified material and equipment as requested by ENGINEER.
      d. Gasket material.

B. Informational Submittals: Submit the following:
   1. Qualifications Statements:
      a. Installer’s Qualifications

C. Record Documentation: Submit the following:
   1. Record Drawings:
      a. During progress of the Work keep an up-to-date set of the Drawings showing field and Shop Drawing modifications. Immediately upon completion of piping Work, submit CADD drawings showing the actual in place installation of all piping and equipment installed under this Section at a scale satisfactory to the CITY. The drawings shall reflect all of the piping Work on plans and in sections, with all reference dimensions and elevations required for complete Record Drawings of the piping systems. Two paper prints shall also be furnished. The prints and electronic copies of the CADD files shall be furnished no later than 30 days after completion of the Contract and prior to final payment.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:
   1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time to prevent delay of the Work.

B. Storage of Materials:
   1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
   2. Store all equipment in covered storage off the ground and prevent condensation and in accordance with the manufacturer's recommendations for long-term storage.

C. Acceptance at Site:
   1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify ENGINEER, in writing, if any loss or damage exists to equipment or components. Replace lost equipment or components and repair damage to new condition, in accordance with manufacturer's instructions.

1.6 GENERAL REQUIREMENTS

A. The Contract Documents show the general arrangement and extent of the Work to be completed. The exact location and arrangement of all parts shall be determined as the Work progresses. The exact location of all parts of the Work must be governed by the general building plans and the actual building conditions.

B. The Drawings show an indication of the arrangement of equipment, piping, valves, etc., and are as nearly correct as can be determined in advance of the actual construction of the Work. Piping, equipment, etc., found to interfere with the construction of the building, plumbing apparatus and piping, electrical wiring or other obstructions, etc., must be changed in location to clear such obstructions.

C. The connections shown to the various units are intended as an indication only. The actual connections at the time of installation to be made and arranged to suit the requirements of each case and adequately provide for expansion and perfect circulation and minimize the amount of space required for the same.

D. The Drawings show the general arrangement of all systems. Should local conditions necessitate rearrangement of one or more of the systems, CONTRACTOR, before proceeding with the Work, shall prepare and submit complete drawings showing all details of the proposed rearrangement for written approval by the ENGINEER.

E. The Drawings do not show all offsets, fittings, accessories and details, which may be required. CONTRACTOR shall carefully examine all of the General Construction, Electrical, Mechanical, Structural and other Drawings and the respective Specifications for conditions which may affect the installation of the Work, and shall arrange the Work accordingly, furnishing all required items to meet such conditions which are not specified as work "by others", to complete the systems to the true extent of the Contract Documents.

PART 2 - PRODUCTS

2.1 PIPING

A. Steel Pipe:
   1. Pipe:
      a. Reference: Pipe sizes 2 inches to 24 inches ASTM A53, Type S, Schedule 40, Grade B.
      b. Reference: Pipe sizes less than 2 inches: ASTM A106, Schedule 40.
      c. Weight: Schedule 40.
      d. Finish: Black.
      e. Piping 2 inches and larger shall conform to ASTM A53.
      f. Piping 1-1/2 inches and smaller shall conform to ASTM A106.
      g. End Connections:
         1) Schedule 40: Up to 1-1/2-inch size, may be threaded.
         2) Schedule 40: 2-inch and larger shall be welded; weld end (API 1104, ASME Section IX Boiler and Pressure Vessel Code. Connections to regulators, valves, meters with flanged ends shall be flanged).
   2. Fittings:
      a. Threaded:
         1) Reference: ANSI B16.33, 150 pound.
         2) Material: Malleable iron.
         3) Finish: Black.
   3. Unions:
      a. Threaded: Malleable iron, FS WW-U-531, Class 1, Type B.
   4. Joint Compound:
      a. Material: Resistant to the action of liquefied petroleum gas or natural gas.
   5. Insulating couplings, Dresser, a steel body with gaskets and retainer cups.

B. Copper Tubing and Fittings:
   1. Type: K or L.
   2. Brazed joints.
   3. References: ASTM B 88 or ASTM B 280.

C. Plastic Pipe, Tubing and Fittings:
   1. Plastic pipe, tubing and fittings including service piping shall be installed outdoors, underground only and shall conform to ASTM D 2513.

2.2 VALVES

A. Lubricated Plug Valves:
   1. Manufacturer: Provide products of one of the following:
      a. Walworth Company.
      b. Nordstrom Valves, Inc.
      c. Valmatic.
      d. Or equal.
   2. Type: Short pattern, wrench operated.
   3. Pressure rating: 175 lb wog - 350 lb test.
   4. End connections: Threaded (up to 2-1/2-inch); flanged (3-inch and larger).
   5. Construction: Cast iron body and plug with steel trim.
   6. Sealant: Suitable for gas application.
   7. Wrench: To suit valve.

B. Lubricated Stop Cocks (1/2"-2"):
   1. Manufacturer: Provide products of one of the following:
      a. Eclipse Fuel Engineering Company.
      b. A. Y. McDonald Manufacturing Company.
      c. Or equal.
   2. Type: Flat head.
   3. Pressure rating: 125 lb wog.
   4. End Connections: Threaded.
   5. Construction: Iron body, bronze plug

2.3 EQUIPMENT

A. Natural Gas Pressure Regulator: In accordance with the requirements of the local utility company.

B. Natural Gas Meter
   1. Manufacturer: In accordance with requirements of the local utility company.

C. Dielectric Couplings:
   1. Manufacturer: Provide products of one of the following:
      a. Epco Sales Incorporated.
      b. Watts Regulator Company.
      c. Or equal.
   2. Type: Union.

D. Vent Pipe Caps:
   1. Manufacturer: Provide products of one of the following:
      a. UPSCO, Incorporated.
      b. Richards Manufacturing Company.
      c. Or equal.

2.4 NAMEPLATES AND MARKINGS

A. All pipeline materials shall be stamped, marked or identified with the following:
   1. Name of manufacturer.
   2. Pipe size.
   3. Material.
   4. Wall thickness.
   5. Rating.

2.5 PAINTING

A. All piping and accessories shall be painted in accordance with the requirements of Section 09 91 00, Painting.

2.6 FINISH

A. Exposed Piping:
   1. A coat of rust inhibitive primer in conformance with Section 09 91 00 shall be applied before painting the exterior of the pipe.

B. Buried Piping:
   1. The exterior coating for the underground gas piping shall be extruded polyolefin resin meeting the requirement of NACE SP0185-2007 which is made part of these specifications. The polyolefin resin shall be crosshead-extruded on the pipe as a seamless coating over hot-applied Mastic adhesive as manufactured by Royston Labs Inc. or equal.
   2. The coating application thickness shall conform to the manufacturer's specifications with minimum 8 mils of adhesive and 23 mils of polyethylene. All coated pipe shall be 100% electrically inspected for holidays immediately after coating application. The voltage of the holiday detector shall be adjusted to the level specifically recommended for the thickness of the coating but shall not be less than 6,000 volt.
   3. The coated pipe shall be handled, shipped and stored in strict accordance with SP0185-2007 or the pipe coating company's standards. Field coating for pipe joints and holiday repairs shall be made using heat shrinkable sleeves or wraps in accordance with SP0185-2007

PART 3 – EXECUTION

3.1 INSTALLATION

A. General:
   1. Install all items as shown, specified, and as recommended by the manufacturer.
   2. Request instructions from ENGINEER, in writing, when there is a conflict between the manufacturer's recommendations and the Contract Documents.

3. Present conflicts to ENGINEER, in writing, who will determine corrective measures to be taken.
4. Do not modify structures to facilitate installation of piping, unless specifically approved by ENGINEER.
5. Installation shall conform to requirements of all local and state codes.
6. Installation of piping shall be in accordance with Section 22 10 53, Installation of Plumbing Piping, NFPA 54 (ANSI Z223.1) and local utility gas company.
7. Installation of hangers and supports shall be in accordance with Section 22 05 29, Hangers and Supports for Plumbing and Piping Equipment.
8. Installation of pipe sleeves shall be in accordance with Section 22 05 27, Pipe Sleeves for Plumbing.
9. Unions shall be provided for all screwed piping at connections to equipment and at convenient locations to permit disassembly of piping.
10. Wherever changes in sizes of piping occur, changes shall be made with reducing fittings. The use of bushings is not permitted unless otherwise shown.
11. All underground piping shall be coated with 2 coats of coal tar enamel.
12. All underground service piping shall be installed with a minimum cover of 2'-6" and installed in accordance with Section 31 23 05, Excavation and Fill.
13. All joints are to be welded except that "Dresser" type connections shall be used at drip pots and valves. Provide an 8 gauge, copper, bonding wire brazed to pipe on both sides of the "Dresser" fitting.
14. Gas service lines shall pitch away from building, where possible. If they are pitched toward the building they shall be provided with drip leg and plugged outlet or drip pot as required.
15. All gas piping in building shall be straight, free from traps and unnecessary bends and conform to building construction. Piping shall be graded 1" in 40 feet to be provided for drainage of moisture, by 6" drip legs in accessible locations at low points of system. Branch connections to mains shall be from top of main or at a 45° angle.
16. Each gas pressure regulator shall be vented through the roof and terminated 6 feet 0-inches above the roof with an approved gas vent cap.
17. Solenoid vent valve vents furnished on gas-fired equipment with Gas Trains shall be individually vented through the roof and terminated 6-feet 0-inches above the roof with an approved gas vent cap.
18. Make final connections to gas-fired equipment furnished by HVAC Contractor.
19. Protection: Properly plug or cap the open ends of all piping at the end of each day's Work or other stopping point through construction. Equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical damage.

3.2 FIELD QUALITY CONTROL

A. Field Tests:
   1. Tests: Air test piping in accordance with Section 22 10 63, Testing of Plumbing Piping Systems.

2. Fill all systems and fully test all equipment, valves, etc. in operation.
3. Check for excessive vibration while all systems are operating.
4. Installed systems and components will not be released to DEPARTMENT or CITY, unless all systems have been tested and approved by the ENGINEER.

B. Inspection:
1. Examine areas to receive piping, valves and accessories for:
   a. Defects that adversely affect execution and quality of the Work.
   b. Deviations beyond allowable tolerances for piping, valves and accessories.
   c. Start the Work only when conditions are satisfactory.
2. The ENGINEER reserves the right to reject or authorize replacement of piping and accessories found to be defective, blistered, cracked or deviated from allowable tolerances as described above.

3.3 ADJUSTING AND CLEANING

A. Adjusting:
1. While system is operable, balance all equipment, valves, etc. to achieve design conditions.

B. Cleaning:
1. Thoroughly clean all piping, fittings, valves, and accessories prior to installation.
2. Remove all dirt, rust, dust, etc. from piping in preparation for painting.
3. Remove and dispose of all debris and waste from the Site resulting from installation.

3.4 MATERIAL SCHEDULES

A. Piping:
1. Use types of pipe and fittings as specified below, unless otherwise specified or shown.
2. All exposed gas piping within the interior of a building or run within a chase or shaft shall be Schedule 40 black steel. All gas piping at a pressure of 1 psig or higher within the building shall be welded. All gas piping 1-inch diameter and larger shall be welded.
3. Use "butt welded" fittings for welded steel pipe connections.
5. Copper tubing shall not be used if the gas contains more than an average of 0.3 grains of hydrogen sulfide per 100 standard cubic feet of gas.
6. Use "wrought copper" fittings for copper tubing.

++ END OF SECTION ++

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SECTION 22 33 00

DOMESTIC WATER HEATERS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install domestic water heaters complete with accessories.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before domestic water heaters Work.
   2. Notify other contractors in advance of installing domestic water heaters to provide other contractors with sufficient time for installing items included in their contracts to be installed with or before domestic water heaters work.

C. Related Sections:
   1. Section 09 91 00, Painting.
   2. Section 22 11 16, Domestic Water Piping.
   3. Section 22 13 16, Sanitary waste and vent Piping.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ASME Boiler and Pressure Vessel Code.
   2. ASME/ANSI Z21.22, Relief Valves for Hot Water Supply Systems.
   3. ASHRAE 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings.
   4. NSF/ANSI 61, Drinking Water System Components – Health Effects.
   5. UL 1453, Electric Booster and Commercial Storage Tank Water Heaters.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: Shall have a minimum of five years experience producing equipment substantially similar to that required, and shall be able to document evidence of at least five installations in satisfactory operation for at least five years each.

B. Component Supply and Compatibility:
   1. Obtain each type of domestic water heater equipment included in this Section, regardless of component manufacturer, from one domestic water heater equipment manufacturer.
   2. Each domestic water heater manufacturer shall review and approve, or shall prepare, all Shop Drawings and other submittals for components furnished under this Section for the particular equipment type.
   3. Materials and equipment shall be suitable for the required service conditions and shall be integrated into each assembly by the associated domestic water heater manufacturer.

C. Regulatory Requirements: Comply with Laws and Regulations, including the following.
   1. National Fire Protection Association.
   2. SCAQMD Rule 1146.2, Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers and Process Heaters.
   3. Local and State Building Codes and Ordinances.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Schedule of domestic water heaters for the Project, indicating for each the installation location, model or type, and other distinguishing information.
      b. Drawings showing fabrication methods, assembly, accessories, and installation details.
      c. Detailed drawings of each equipment item's and component's wiring diagrams.
      d. Detailed installation drawing of each individual component showing:
         1) Mounting requirements.
         2) Item locations, such as in a panel, installed on floor, or elsewhere.
         3) Piping and wiring connections labeled and coded.
         4) Data sheets.
      e. Detailed description of each component.
   2. Product Data:
      a. Manufacturer's literature, illustrations, specifications, weight, dimensions, required clearances, materials of construction, and performance data for all equipment.

B. Informational Submittals: Submit the following:
   1. Manufacturer's Instructions:
      a. Special shipping, storage and protection, and handling instructions.
      b. Installation data for the equipment, including setting drawings, templates, and directions for installing anchorage devices.
   2. Source Quality Control Submittals:
      a. Submit results of required factory tests and inspections.
   3. Qualifications Statements:

a. Manufacturer, when submittal of qualifications is required by ENGINEER.

C. Closeout Submittals: Submit the following:
1. Operations and Maintenance Data:
a. Submit in accordance with Section 01 78 23, Operations and Maintenance Data.
b. Include maintenance data and schedules, description of operation, wiring diagrams, and list of spare parts recommended for one year of operation with current price list.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling, and Unloading:
1. Deliver materials and equipment to Site to ensure uninterrupted progress of the Work. Deliver anchorage materials to be embedded in concrete in ample time to prevent delaying the Work.
2. Comply with Section 01 65 00, Product Delivery Requirements.

B. Storage and Protection:
1. Store materials and equipment in covered storage off the ground and prevent condensation and in accordance with the manufacturer's recommendations for long-term storage.
2. Comply with Section 01 66 00, Product Storage and Handling Requirements.

PART 2 – PRODUCTS

2.1 INSTANTANEOUS WATER HEATER

A. Instantaneous Gas Water Heater: (Packaged Multiple Tankless System): GWH:
1. Heater Type: Wall-mounted high efficiency condensing type instantaneous gas-fired water heaters.
2. Service Conditions:
a. Domestic Hot Water System: (2 Water Heaters):
1) Maximum Hot Water Capacity: 7.6 gpm at 100 ºF water temperature rise.
2) Minimum Flow: 0.5 gpm.
3. Products and Manufacturers: Provide one of the following:
a. Rinnai Corporation, Ultra Series, RU98i.
b. AO Smith, Model ATI-540H-N.
c. Noritz America Corporation, Series NCC1991.
d. Or equal.
4. Heater Style: Condensing type tankless water heater.
5. Materials:
a. Exterior Casing: Stainless steel.
b. Heat Exchangers: Stainless steel and copper.

c. Components: Stainless steel.
d. Vent: PVC or polypropylene exhaust and intake vents.

6. Heaters shall not have:
   a. Sharp edges.
   b. Scratches on exposed surfaces.
   c. Loose fasteners.
   d. Loose panels.
   e. Dents on outer jacket.
7. Water Heater Gas Input Each: (Minimum):
   a. Natural Gas: 15,000 Btu per hour.
   b. Natural Gas Pressure: 4.0 inches of water column.
8. Water Heater Gas Input Each: (Maximum):
   a. Natural Gas: 199,000 Btu per hour
   b. Natural Gas Pressure: 14 inches of water column.
9. Gas Connection Each: 3/4-inch diameter NPT.
10. Water Connections Each: 3/4-inch diameter pipe nipples, non-ferrous, for connection to hot-and cold-water piping system.
11. Electrical Each: 120 V, 1 Ph, 60 Hz.
12. Multiple system control wiring supplied by manufacturer, 120 V, 1 Ph, 60 Hz.

2.2 ACCESSORIES

A. Common venting or concentric venting system shall be included in the packaged multiple gas-fired tankless water heater system. The gas heater manufacturer shall be responsible for the design and installation of the complete intake and exhaust venting system. The design intention shall be to minimize number of wall penetrations and provide sealed-combustion system for optimum safety and performance. Terminate all vents through building walls, 3 feet minimum above openable windows, doors and building openings and 10 feet horizontally away from intake vents, openable windows, doors and other building openings.

B. Multiple wall mount support rack system shall be furnished by the water heater manufacturer.

C. Provide high limit energy cut-off on thermostat to interrupt gas flow to heater when water temperature inside of tank exceeds 190 degrees F

D. Linking control wire by the water heater manufacturer.

E Vacuum Breakers: Provide one as required for each water heater furnished:
1. Products and Manufacturers: Provide one of the following:
   a. Watts 36A, Vacuum Relief Valve.
   b. Johnson, VB8.
   c. Or equal.

2.3 FINISHING

A. Factory-paint ferrous surfaces in accordance with Section 09 91 00, Painting. Do not paint enameled surfaces, stainless steel, brass, chrome-plated, and other finished surfaces.

2.4 SOURCE QUALITY CONTROL

A. All equipment shall be completely manufactured and pre-assembled in accordance with applicable reference standards indicated in this Section. Perform the following tests and inspections at factory before shipment:
   1. For each assembled unit, test and inspect equipment in accordance with UL requirements.
   2. Test and inspect in accordance with ASME Boiler and Pressure Vessel Code.
   3. Perform hydrostatic testing tanks as required in this Section for individual equipment items.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine conditions under which materials and equipment will be installed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. General:
   1. Water heaters will supply 140 ºF hot water to the tepid water mixing valve provided under Section 22 11 16.
   2. Thoroughly clean materials, equipment, and accessories prior to installation.
   3. Install items as in accordance with the Contract Documents, Laws and Regulations, manufacturer's recommendations, and good practice. Obtain interpretation from ENGINEER if manufacturer's instructions or Laws or Regulations conflict with the Contract Documents.
   4. Do not modify structures or facilities to facilitate installation of equipment without approval of ENGINEER.
   5. Provide each domestic water heater with shut off valves for required water supplies.
   6. Pipe, run and spill water heaters condensate drain lines to funnel drain/neutralization basin provided under Section 22 13 16.

3.3 FIELD QUALITY CONTROL

A. Site Tests:
   1. ENGINEER shall witness field tests.
   2. Fill all systems and verify that equipment, valves, and appurtenances operate successfully and in accordance with the Contract Documents.
   3. Check for excessive vibration while systems are operating.
   4. For materials and equipment that do not successfully pass field tests, make repairs or modifications and retest until acceptable results are achieved.

B. Manufacturer's Services: Provide a qualified, factory trained serviceman to perform the following:
   1. Supervise installation of equipment.
   2. Instruct CONTRACTOR in installing equipment.
   3. Inspect and adjust equipment after installation and ensure proper operation.
   4. Instruct operations and maintenance personnel in operation and maintenance of the equipment.
   5. Manufacturer's technician shall make visits to the Site as follows:
      a. First visit shall be for instructing CONTRACTOR in proper equipment installation, and assisting in installing equipment. Minimum number of hours on-Site: 8 hours.
      b. Second visit shall be for checking completed installation, start-up of system; and performing field quality control testing. Minimum number of hours on-Site: 8 hours.
      c. Third visit shall be to instruct operations and maintenance personnel.
         1) Furnish services of manufacturer's qualified, factory-trained specialists to instruct CITY's operations and maintenance personnel in recommended operation and maintenance of equipment.
         2) Training requirements, duration of instruction, and qualifications shall be in accordance with Section 01 79 23, Instruction of Operations and Maintenance Personnel.
         3) Number of hours on-Site shall be in accordance with Section 01 79 23, Instruction of Operations and Maintenance Personnel.
      d. Technician shall revisit the Site as often as necessary until installation is acceptable.
   6. All costs, including expenses for travel, lodging, meals and incidentals, and cost of travel time, for visits to the Site shall be included in the Contract Price.

3.4 ADJUSTING AND CLEANING

A. Adjusting:
   1. Adjust controls for proper settings.
   2. While system is operable, balance all equipment, including valves, appurtenances, and similar equipment, to achieve specified service conditions.
   3. Adjust thermostats to desired water outlet temperature.

B. Cleaning:
   1. Upon completion of the Work, remove all non-permanent labels, and remove dirt, grease, markings, and other objectionable matter from equipment.
   2. In preparation for painting, remove dirt, rust, dust, and objectionable materials from materials and equipment.

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