

PROPOSAL

FOR

TAN 26-9A D215077

NIAGARA SECTION PUMPHOUSE UPGRADE
ON I-190, MP N9.1

BOOK 1 OF 1

THIS BOOK CONTAINS SPECIFICATIONS AND
BID PROPOSAL WORKSHEETS

SUBMITTED IN ACCORDANCE WITH THE NEW YORK STATE
DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS
OFFICIALLY ADOPTED JANUARY 1, 2026 EXCEPT AS MODIFIED
IN THE PLANS AND/OR PROPOSAL AND ANY CHANGES WITH
ARTICLE 2, TITLE 9 OF THE PUBLIC AUTHORITIES LAW.

LETTING OF
APRIL 29, 2026

BIDS DUE: 10:30 A.M.
BIDS OPEN: 11:00 A.M.



**Thruway
Authority**

200 Southern Blvd., Albany, NY 12209

NOTICE **TO** **BIDDERS**

In addition to the bid deposit requirement, this Proposal shall be accompanied by a Statement of Surety's Consent on the form furnished by the Authority. (See last page).

BIDDERS ARE SUBJECT TO LOSS OF BID DEPOSIT FOR FAILURE TO OBTAIN PROPER BONDING.

Thruway Authority Designated Contacts

Pursuant to NYS Finance Law Sections 139-j and 139-k, the following people are the designated contacts for this procurement process:

For all technical or engineering related questions:

- Nick Tario, RA
Project Designer
Nicholas.Tario@thruway.ny.gov

Or

- Dan Livermore, PE
Deputy Director, Structures Design Bureau
Dan.Livermore@thruway.ny.gov

Or

- Albert Mastroianni, PE
Director, Office of Design
Albert.Mastroianni@thruway.ny.gov

For all procurement contract process related questions:

- Karolyn Giardina
Office of Procurement Services
Karolyn.Giardina@thruway.ny.gov

Or

Jonathan Hill
Deputy Director of Capital and Contracts Management
Office of Procurement Services
Jonathan.Hill@thruway.ny.gov

For more information about NYS Finance Law Sections 139-j and 139-k, please see the New York State Thruway Authority Guidelines for Lobbying included in this Proposal.

NEW YORK STATE THRUWAY AUTHORITY

NOTICE TO BIDDERS

The Thruway Authority conducts public bid openings. Visitors who choose to hand deliver a bid and/or witness the bid opening are limited to one person. The Thruway Authority also uses  YouTube to broadcast its live bid openings. The link to live streams are available from the Thruway website here: <https://www.thruway.ny.gov/news/meetings/bid-openings.html>

or directly from  YouTube at:

<https://www.youtube.com/@nysthruwayauthority6263/streams>

Sealed bids must be hand delivered, or delivered by first class mail, USPS Express or Priority Mail, or overnight delivery service (e.g., FedEx, UPS) to the New York State Thruway Authority Headquarters Building, at the following address only: New York State Thruway Authority, 200 Southern Boulevard Albany, NY 12209.

Sealed bids should not be sent or delivered to any other address or location, and the Authority is not responsible for any late deliveries or misdirected bids.

Regardless of the delivery method selected, all sealed bids, whether paper or electronic form, must be delivered by 10:30 A.M, on Wednesday, April 29, 2026, where they will be opened publicly and read aloud at 11:00 A.M. Any bids sent or delivered to an address or location other than the one specified above, or received after this time, will not be accepted.

Contract TAN 26-9A / D215077 Niagara Section Pumpouse Upgrade on I-190,
Milepost N9.1 in Erie County in accordance with the Plans and Specifications.

Your bid must be secured with either a Bid Bond or a Bid Deposit. A Bid Bond must be in the amount of 5% of the total bid and must be on the Authority's Bid Bond Form (TA-44117) which is included in the Proposal. A Bid Deposit must be a certified check or cashier's check made payable to the New York State Thruway Authority in the amount of **\$200,000.00.**

Plans, proposals, and information on how to download Contract Bid Data are available on the Authority's Website at www.thruway.ny.gov.

SPECIAL NOTE

The New York State Thruway Authority has discontinued the practice of reproducing and furnishing full-size and half-size plans to Contractors after contract award. Contractors shall be responsible for their own hard copies of plans and proposals at no additional cost to the Authority.

New York State Can Help You Secure Surety Bonding

The NYS Surety Bond Assistance Program (NYSBAP) provides technical and financial assistance to help contractors secure surety bonding. Contractors may be eligible to receive a guarantee of up to 30% to secure a surety bond line, bid bond or a performance and payment bond on State projects. Training is also available to contractors requiring technical support on how to become bond-ready. For more information and to fill out a NYSBAP application, visit <https://esd.ny.gov/new-york-state-surety-bond-assistance-program> or contact Ms. Huey-Min Chuang at Empire State Development at 212-803-3238 or BAP@esd.ny.gov.

SPECIAL NOTE
REQUEST FOR INFORMATION (RFI)

A **request for information (RFI)** is a written process used to clarify a detail, specification, or note in the contract documents, provide notification of a possible error or omission, or request a minor modification due to possible unforeseen issues that may occur during construction.

However, during the period between project advertisement and award of contract, the prospective Bidder/Contractor shall submit all RFIs to the appropriate “Designated Contact” via e-mail, as listed elsewhere in the Proposal. The prospective Bidder’s/Contractor’s RFI shall be forwarded to the designated contact. The Bidder Request for Information, Thruway Authority form TA-W44137, can now be found on the Authority’s website at:

<http://www.thruway.ny.gov/business/contractors/documents/ta-w44137.pdf>

This form should be filled out as completely and accurately as possible, numbered sequentially, as may be necessary, and saved in pdf format. Any supporting information that may help describe the issue more clearly, as well as any suggestions or recommendations for possible resolution, should also be provided. The form once complete shall be forwarded to the designated contact as instructed in the form.

Responses by the Authority to RFI’s will be documented as Questions and Answers and posted for all bidders’ reference, under each respective project, on the Thruway Authority’s website at:

<http://www.thruway.ny.gov/business/contractors/documents/index.shtml>

Questions and Answers posted to the Authorities internet page may not be memorialized as amendments. Thus, prospective bidders are advised to check the Thruway Authority’s website regularly before letting (or proposals are due), for Questions and Answers updates. Please be advised that RFI’s submitted the week of the letting may not be answered.

Any changes to the Contract documents that result from an RFI will be addressed via an amendment.

New York State Thruway Authority
Contract No. TAN 26-9A

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PROJECT INFORMATION

NEW YORK STATE THRUWAY AUTHORITY
DEPARTMENT OF ENGINEERING
PROPOSAL ESTIMATE FOR
NIAGARA SECTION PUMPHOUSE UPGRADE ON I-190
AT
MILEPOST N9.1
IN THE
BUFFALO DIVISION
OF THE
NEW YORK STATE THRUWAY
IN
ERIE COUNTY

TYPE	LIMITS
Pumphouse Upgrade	Niagara Section Pumphouse on I-190, Milepost N9.1 Plus Advance Signing

DEPOSIT REQUIRED \$200,000.00

COMPLETION DATE April 15, 2027

PRE-AWARD NOTICE

A Pre-Award Meeting has not been scheduled for this project. If a Pre-Award Meeting is deemed necessary, notice of the date and time will be provided.

To assist the Authority in its award process, the successful low bidder must furnish the following items upon request:

1. A current New York State Uniform Contracting Questionnaire (NYSUCQ) CCA-2 form must be on file;
2. A list of current contracts giving the firm or agency for which they are being performed, the name and phone number of someone therein familiar with the contractor's work, the contract amount, and percent of completion;
3. Pre-Award Project Schedule;
4. Documentation of the actions taken to comply with the Minority/Women's Business Enterprise Utilization goals (Non-Federal), or Disadvantaged Business Enterprise goals (Federal) as defined in the Proposal;
5. A "Schedule of Participation of Minority/Women's Business Enterprise" (Form TA-1022), or Disadvantaged Business Enterprise" (Form TA-1022F);
6. AAPHC-89 Approval to Subcontract.

Contract Documents will be supplied with the Authority's notice to the successful low bidder and must be executed and returned to the Authority within ten (10) days of receipt.

If a Pre-Award Meeting is held, it is requested that the Project Superintendent be present. The Contractor should be prepared to provide, upon request by the Authority, information regarding, among other things, the following:

1. Use of subcontractors, including who they will be and what items of work they will perform;
2. Suppliers and manufacturers;
3. Traffic control and safety;
4. Any anticipated problems that could affect the progression of the project.

CONTRACT AWARD

The award process cannot begin until the executed Contract Documents have been returned to the Authority and the successful Low Bidder has provided acceptable documentation with regard to his actions taken to comply with the M/WBE goals of this Contract or DBE Goals for Federally Aided Contracts.

ALL BIDDERS**PRE-BID INSPECTION**

The prospective bidder must have in its possession the Contract Plans/Proposal and a Work Permit for identification purposes when conducting a pre-bid inspection of the Thruway facility.

The prospective bidder shall inform the appropriate Division Point of Contact (listed below) prior to visiting the site and shall strictly comply with all instructions and requirements.

- **The New York State Thruway Authority Permit Application (TA-W5124)** and information on required insurance documentation is available at <https://www.thruway.ny.gov/business/forms-guidelines#occupancy-%26-work-permits>. The application along with insurance documentation shall be submitted to the appropriate Thruway Authority Division Permit Coordinator as indicated on page 2 of the application. The fee is waived for this Pre-Bid Inspection.

<u>Division</u>	<u>Point of Contact</u>	<u>Phone</u>
New York	Timothy Mathew	(845) 918-2510
Albany	Michael Beaudet	(518) 471-5940
Syracuse	Trevor Thieme	(315) 438-2384
Buffalo	Nicholas Przybylski	(716) 635-6253

Provisions of Section 107-05, Equipment Safety Procedures, contained in the Contract Proposal shall apply to all Pre-Bid Inspectors and shall be strictly adhered to while performing the pre-bid inspection.

PRECONSTRUCTION MEETING

A Pre-Construction Meeting will be held prior to the start of construction. The time, date and location will be coordinated by the Division Construction Engineer who will provide this information to the successful low bidder as soon as it is available.

WITHDRAWAL OF BID

A Contractor may at any time, upon at least fifteen (15) days written notice, withdraw its bid on a date sixty (60) days after bid opening or thirty (30) days after the properly executed contract documents have all been received by the Authority, whichever is later. The bid bond, bid deposit, and/or performance bond shall remain in effect until such period of written notice has expired provided the contract has not been approved by the Office of the State Comptroller in the interim.

The Contractor and the Authority may agree in writing to extend the date upon which the bid may be withdrawn if the contract has not been approved by the Office of the State Comptroller.

WORK TO BE DONE

The following is a general description of the work to be done under this Contract. This list is intended to give the Contractor a general description of the work involved in this Contract and is not a complete listing of all work to be done. All work shall be done in accordance with the Contract Documents even though not specifically mentioned in this list.

1. Replace existing electrical service and change the service to a 480V three phase system from pole to building. This will include new electrical panels, disconnects and all electrical components to completion. the replacement of all conduits and wire while keeping the existing standby generator intact for reuse.
2. Replace and upgrade all electrical pump and motor control cabinets using all new state of the art controls to perform the necessary functions for monitoring and pumping of high water.
3. Replace and upgrade float systems to a state-of-the-art water level monitoring system.
4. Replace all electric motors and pumps to 480v three phase units in a three-sequence setting. The statistics on pumping capabilities and motor power shall be designed to on site conditions.
5. Update and replace all interior lighting in pump house and wet well with approved waterproof fixtures, conduits and switch housings.
6. Replace the exterior vestibule enclosure, exterior door and roof over the entrance stairs to the pump house.
7. Install new site lighting in the paved area and around the existing building for safety and security.

SCHEDULE AND SUSPENSION OF WORK

The New York State Thruway is a limited access, high-speed, high-volume highway. Traffic shall be maintained in accordance with the *Manual on Uniform Traffic Control Devices (MUTCD)*, the *Work Zone Traffic Control Plans*, the *Standard Specifications* Section 619 and the following provisions:

A. WORK ZONE TRAFFIC CONTROL

1. Lane closures on the Thruway shall only be allowed in accordance with the traffic management table(s), available on the Thruway Authority website at <http://www.thruway.ny.gov/business/contractors/standard-sheets/index.shtml>, unless indicated otherwise in the contract documents. If more than one table is applicable to a work zone location, the most restrictive requirements shall be used. Traffic management tables do not guarantee lane closure availability; the requirements of Section B. *Work Restrictions* shall supersede these tables, when applicable.
2. Lane closures on the Thruway will be permitted for work site access, delivery of materials and equipment, and work operations. Personal vehicles will **NOT** be allowed to park along the Thruway or within lane closures on the Thruway at any time. During non-working hours, all equipment and materials shall be stored at least 30 feet from the edge of pavement (both mainline and ramps) or be protected by a physical barrier approved by the Engineer.
3. Lane closures will **NOT** be permitted during holiday periods or when unforeseen circumstances arise, as described in Section B. *Work Restrictions*, unless indicated otherwise in the contract documents.
4. Lane closures will **NOT** be permitted for the sole convenience of the Contractor. Lane closures will be permitted in order to protect traffic from an actual hazard, as determined by the Engineer.
5. Permanent lane closures will **NOT** be permitted for the duration of the contract.
6. Simultaneous closure of right and left shoulders will **NOT** be permitted unless indicated otherwise in the contract documents. Either right or left shoulder must remain clear and available through all work zones. The open shoulder shall not be used for the storage of vehicles, equipment, supplies or any other obstructions, or for any work activity.
7. Ramp closures will **NOT** be permitted, unless indicated otherwise in the contract documents. Access to interchanges, service areas and parking areas shall be maintained at all times.
8. Traffic will **NOT** be permitted to drive on milled pavement, unless indicated otherwise in the contract documents.

B. WORK RESTRICTIONS

1. **HOLIDAY PERIODS.** Lane closures will **NOT** be permitted during holiday periods, unless indicated otherwise in the contract documents. The Authority may permit work on Thruway facilities only if operations do not inhibit or distract traffic. Access to work sites from state and local roads will be permitted provided the municipality having jurisdiction for the road gives written permission. Holiday periods for this project shall be as follows:

SCHEDULE AND SUSPENSION OF WORK*****BUFFALO DIVISION*****

2026						
HOLIDAY	FROM			TO		
	TIME	DAY	DATE	TIME	DAY	DATE
Dr. Martin Luther King, Jr. Day	Noon	Friday	01/16/2026	11:00 p.m.	Monday	01/19/2026
Presidents' Day	Noon	Friday	02/13/2026	11:00 p.m.	Monday	02/16/2026
Easter	Noon	Friday	04/03/2026	11:00 p.m.	Monday	04/06/2026
Victoria Day (Canada)	Noon	Friday	05/15/2026	11:00 p.m.	Monday	05/18/2026
Memorial Day	Noon	Thursday	05/21/2026	11:00 p.m.	Monday	05/25/2026
Independence Day	Noon	Thursday	07/02/2026	11:00 p.m.	Sunday	07/05/2026
Labor Day	Noon	Thursday	09/03/2026	11:00 p.m.	Monday	09/07/2026
Columbus Day/ Thanksgiving (Canada)	Noon	Friday	10/09/2026	11:00 p.m.	Monday	10/12/2026
Veterans Day	6:00 a.m.	Wednesday	11/11/2026	11:00 p.m.	Wednesday	11/11/2026
Thanksgiving	6:00 a.m.	Wednesday	11/25/2026	11:00 p.m.	Sunday	11/29/2026
Christmas/New Year's Day	6:00 a.m.	Thursday	12/24/2026	11:00 p.m.	Sunday	01/03/2027

2027						
HOLIDAY	FROM			TO		
	TIME	DAY	DATE	TIME	DAY	DATE
Dr. Martin Luther King, Jr. Day	Noon	Friday	01/15/2027	11:00 p.m.	Monday	01/18/2027
Presidents' Day	Noon	Friday	02/12/2027	11:00 p.m.	Monday	02/15/2027
Easter	Noon	Friday	03/26/2027	11:00 p.m.	Monday	03/29/2027
Victoria Day (Canada)	6:00 a.m.	Friday	05/21/2027	11:00 p.m.	Monday	05/24/2027
Memorial Day	Noon	Thursday	05/27/2027	11:00 p.m.	Monday	05/31/2027
Independence Day	6:00 a.m.	Friday	07/02/2027	11:00 p.m.	Monday	07/05/2027
Labor Day	Noon	Thursday	09/02/2027	11:00 p.m.	Monday	09/06/2027
Columbus Day/ Thanksgiving (Canada)	Noon	Friday	10/08/2027	11:00 p.m.	Monday	10/11/2027
Veterans Day	6:00 a.m.	Thursday	11/11/2027	11:00 p.m.	Sunday	11/14/2027
Thanksgiving	6:00 a.m.	Wednesday	11/25/2027	11:00 p.m.	Sunday	11/28/2027
Christmas/New Year's Day	Noon	Thursday	12/23/2027	11:00 p.m.	Sunday	01/02/2028

- Proposed lane closure schedules shall be submitted to the Engineer for review and approval at least one week in advance of the earliest closure.
- The Contractor shall **NOT** be allowed to establish any lane closures during periods of inclement weather, wet or icy pavement, reduced visibility, traffic accident, emergency, or if the lane closure is causing excessive delay to the public. The Authority reserves the right to alter any lane closure and/or direct the Contractor to immediately remove a lane closure during such circumstances. The Authority shall be the sole judge of when conditions warrant these lane closure restrictions, and such restrictions will not entitle the Contractor to file a claim for additional compensation.
- BUFFALO DIVISION:** Work operations shall be scheduled to avoid interference with increased traffic volumes generated by Buffalo Bills home games or Canadian holidays.

SCHEDULE AND SUSPENSION OF WORK

5. **WINTER SHUTDOWN.** A winter shutdown shall be in effect from 3:00 p.m. **November 15** to 6:00 a.m. **April 1**. During this period, the Contractor shall **NOT** be permitted to have lane closures. All temporary tape lines shall be removed, temporary concrete barrier shall be set in its winter shutdown location, and all traffic shall be re-established to its pre-construction configuration on permanent alignment. Mobilization for the following construction season may begin prior to **April 1** with permission from the Authority.
6. The Contractor shall submit a Plan of Operations to the Engineer prior to working on any full-depth repair area shown in the contract documents. The Plan of Operations shall list all full-depth repair areas and the estimated duration to complete each location. The Contractor shall also identify any full-depth repair area that may not be completed within the timeframes allowed by the traffic management table(s). For such location(s), the Contractor may request a waiver of restrictions to complete the repair(s). The Authority will review the request and determine whether or not a waiver will be granted. The Authority has the right to divide repair areas into smaller sections in lieu of granting a waiver.
7. The Contractor shall have 45 calendar days to replace the Milled in Audible Roadway Delineators (MIARDs; Formerly referred to as Shoulder Treatment for Accident Reduction (STAR) groove pattern) where more than 1,500 contiguous feet have been removed by other contract work. The Contractor shall also ensure that MIARDs are installed prior to the official shutdown period, regardless of the 45 calendar day requirement or the length removed. Exceptions to this requirement are shoulders protected by temporary traffic control devices installed as part of a work zone traffic control plan developed in the contract documents or areas directly adjacent to detour pavement that will be used in subsequent phase(s) of the project.

The Contractor shall consider these requirements when preparing bids and scheduling/sequencing the work for this contract. Failure to comply with the time frames specified will be considered a substantial deficiency in work zone traffic control and result in the non-payment for the Basic Work Zone Traffic Control Item for each calendar day during which MIARDs (formerly referred to as STARs) remain incomplete. Liquidated Damages will also be assessed at rates shown in Table 108-1 of the NYSDOT Standard Specifications.

8. Work restrictions may be modified if:
 - a. The Contractor has received permission through the Engineer, from the Division Director or designee, to progress construction operations contained entirely behind temporary concrete barrier. There shall be no hauling of materials in or out of the work site during restricted periods, and open lane availability requirements shall not be violated or compromised.
 - b. The Contractor has received permission through the Engineer, from the Division Director or designee, for temporary modification of the lane availability restrictions for performance of specific construction operations for a specific time period.

NOTE: Such requests must be based on current traffic volumes which would permit the requested temporary modification with little probability of causing disruption or delay to the public.

The Contractor shall include full explanation of the benefits to the Public and to the Authority, which would accrue in granting a temporary waiver for performance of the specific operations including calculations for any credit that may be offered. A contingency plan for action to be taken, should an unexpected traffic backup occur, shall accompany this presentation and will be one prime consideration in evaluating the request.

SCHEDULE AND SUSPENSION OF WORK

- c. The Contractor has received written authorization from the Division Director or designee to perform specific construction operations, violating the lane availability restrictions or other work restrictions during a specifically prohibited time period.

NOTE: The Contractor shall submit a written request to the Authority's Division Director, with copy to the Engineer, for permission to perform specific construction operations at specific locations and times, including a detailed explanation of why the work cannot be performed in conformance with the contract. Such requests must be received at the Division Office at least one full week before the date of the requested variance, and at least two full weeks should granting the waiver require making notice to the public regarding potential disruptions and delays.

If written authorization to work is granted by the Authority, the Contractor shall be strictly limited to those operations approved in the authorization. In making application for a waiver, the Contractor agrees that any waiver of restrictions granted by the Authority is exclusively for the Authority's benefit and purposes, and as such is subject to revocation without requirement for advance notice. Also, the disapproval of requests for waiver of contract requirements is not subject to administrative review or appeal under the contract.

C. GENERAL CONDITIONS

The Contract is to be completed on or before the specified completion date. If, for any reason, the Contractor fails to fulfill this obligation and requests an extension of time and the request is granted, the Authority, as a condition for extending the time of completion, shall retain the right to limit the Contractor's hours and/or days of work and/or impose conditions under which the work shall be performed in order that the traffic may not be unduly inconvenienced.

All the required liability and property damage insurance with the limits stated in this Proposal shall be effective and shall be continued in force throughout the life of this Contract including the stated periods of the suspension of the work.

The Contractor shall consider the foregoing requirement when preparing its "Schedule of Operations".

ADDITIONAL INSURED PARTIES

The following is a list of additional insured parties:

New York State Department of Transportation
 Erie County Water Authority
 City of Buffalo

NON-REVENUE CONTRACTOR TRAVEL

NYS Thruway has converted to Cashless Tolling, Non-revenue pass plates will no longer be furnished to the Contractor.

Contractors and Consultants must have a properly mounted E-Z Pass transponder and must submit their EZ-Pass information to the Thruway to avoid charges for contract related business on the Thruway. The Project Engineer will provide the form used to record and submit EZ Pass information. Initial information shall be submitted to the Project Engineer prior to the start of work on the project. The initial form and any changes shall be submitted 5 working days prior to intended travel.

The Contractor shall be responsible for any and all tolls charged to contractor owned vehicles with (or without) E-ZPass Transponders not registered with the Authority.

OTHER CONTRACTS

The Contractor will be required to coordinate work with other contractors and NYSTA maintenance forces. The following contracts have been let and may have work in progress during the duration of this contract:

<u>CONTRACT NO.</u>	<u>DESCRIPTION</u>	<u>COMPLETION DATE</u>
TAB 25-35 / D215066	Buffalo/Syracuse Division Pavement Striping	08/28/2026
TAN 25-20B / D215043	Bridge Rehabilitation at I-190 over Scajaquada Creek, MP N8.75	11/20/2026
TAB 25-32 / D215063	Buffalo Division On-Demand Repairs	12/31/2027

The following contracts are anticipated to be let and may have work in progress during the duration of this contract:

DESCRIPTION

None

**ENGINEER'S OFFICE, CONTRACTOR'S FIELD OFFICE
AND STAGING AREA**

There are **NO** locations within the Thruway right-of-way for the Engineer's Office, Contractor's Field Office and staging area. The Contractor shall be required to find a suitable site, or sites, off Thruway right-of-way.

U-TURNS/CROSSOVERS

The Contractor will not be permitted to make U-turns or crossovers at any location on the Thruway system. All vehicles must exit the Thruway system and re-enter for all direction changes. All applicable traffic laws must be followed.

SPOIL AREA

There is no identified spoil area within the Thruway Authority's right-of-way for this contract. Therefore, the Contractor shall remove all surplus material and waste from Thruway Authority (Authority) property. The Contractor shall bid accordingly for this condition.

The Contractor shall provide the Authority a copy of all easements and/or access agreement letters received from landowner(s) of off-site disposal area(s) prior to disposal of any material. The easements and/or access agreement letters must include a statement by the Contractor and the landowner that the disposal of the material is in compliance with all applicable federal, state and local laws and regulations.

Should a mutually approved spoil use area within the Authority's right-of-way be identified for Contractor use after the project letting, a credit in the amount of 50% of the unclassified excavation unit bid price will be deducted for each cubic yard spoiled within the Authority right-of-way. If the contract does not contain an unclassified excavation item, the credit will be determined using either 50% of the item generating the spoil or 50% of the Division/Regional weighted average bid price for unclassified excavation, whichever is less. This credit may be waived, either wholly or in part, by the Division Director in writing if it is determined that permitting spoil on Authority right-of-way is in the best interest of the Authority (ie: slope flattening resulting in elimination of guide rail).

OVERHEAD GANTRY
SIGNING

Signs shall be installed within the project limits when any component of equipment will be operating above 14'-6" in elevation and within 100 linear feet of an overhead gantry. Overhead gantries may have electric powered wires and special equipment, therefore, vehicle and equipment operations must be planned and proposed equipment safety procedures included in a Project Safety and Health Plan.

As mentioned in the Thruway Addendum to the Standard Specifications (TA), specifically in **Section 107-05 SAFETY AND HEALTH REQUIREMENTS, O. Equipment Safety Procedures. 6. Work Operations. d.** Dump truck boxes may be raised only under the control of a spotter, unless the vehicle is in an area clearly marked to be free of overhead wires and safe for dumping.

Refer to Thruway Standard Sheet **TA 619-27** for additional information and signing requirements.

OVERHEAD GANTRY
TRAFFIC SHIFT RESTRICTIONS

The Contractor shall not shift traffic at any toll gantry such that vehicles are traveling between lanes or between lanes/shoulders when passing under the gantry centerline (treadle). Traffic shifts, for purposes of staging work, shall be done prior to or after the gantries, such that vehicles are traveling within a complete lane or shoulder when passing under the gantry centerline (treadle). All work zone traffic control shall be provided in accordance with the 619 Standard Specifications and the Thruway Addendum to the 619 Standard Specifications, the National Manual on Uniform Traffic Control Devices and NYS Supplement, any provisions contained within the contract documents, and as ordered by the Engineer.

OVERHEAD GANTRY
PARKING RESTRICTIONS

The Contractor shall not park any vehicle or construction equipment directly beneath overhead gantries, within a complete lane or between a lane/shoulder, unless it is required to perform project specific related work, as directed by the Engineer in Charge and after coordination with the Authority's Intelligent Transportation System Management unit.

SPECIAL NOTE**Section 108-05 Self Perform Work and Second Tier Subcontractor Requirements**

Under this contract, Standard Specification Section 108-05 requirements are modified to require the Contractor to perform, with its own organization, contract work amounting to not less than 30 percent of the total contract bid price. The amount for any items designated as "Specialty Items" will be deducted from the original total contract bid price before computing the amount of work required to be performed by the Contractor with its own organization.

Under this contract, Standard Specification Section 108-05 requirements are modified to permit individual Subcontractors to assign work to lower tier subcontractors. All lower tier Subcontractors must obtain the same approvals from the Authority as required by first tier Subcontractors prior to beginning work. Work by a non-approved Subcontractor or Trucker will be suspended by the Engineer and payment for work by a non-approved Subcontractor or Trucking Firm may be withheld.

SUPPLEMENTAL INFORMATION FOR BIDDERS

Supplemental information is available to bidders. As indicated below, information is either available on the Thruway Authority's website with the contract plans and proposal or available in electronic format from the Thruway Authority upon request prior to or after the letting date.

The bidder's signature on this proposal certifies that they have made themselves aware of the availability of the information indicated below prior to the letting date.

INFORMATION	NOT AVAILABLE	AVAILABLE ON THRUWAY AUTHORITY WEBSITE
Engineer Estimate Quantity Workups	X	
Utility Estimate Sheets with Names of Utility Officials	X	
Earthwork Cross Section Sheets	X	
Earthwork Sheets	X	
Drainage Estimate Sheets	X	
Sign Face Layouts	X	
Subsurface Exploration Logs		X
Rock Core Evaluation Logs and Photographs	X	
Compression Test Data from Rock Samples	X	
Pavement Core Logs and Photographs	X	
Logs Showing Laboratory Description of Soil Samples	X	
Laboratory Test Data from Soil Samples	X	
Rock Outcrop Maps	X	
Record Plans		X
Applicable Asbestos Blanket Variances	X	
Storm Water Pollution Prevention Plan	X	
Shop Drawings	X	
CADD Files of Contract Plans (Unofficial - Not signed or stamped)	X	
Force Main Televising Report		X
Pre-Renovation Survey		X

Hard copies of the supplemental information indicated above are not available. Contractors shall be responsible for their own hard copies of this information at no additional cost to the Authority.

**REVISIONS TO
NYSDOT
STANDARD
SPECIFICATIONS**

NEW YORK STATE THRUWAY AUTHORITY ADDENDUM TO THE STANDARD SPECIFICATIONS

The Standard Specifications published by the New York State Department of Transportation shall form a part of the agreement. The dated edition that applies to this contract is provided on the front cover of the Proposal. All work contemplated under this contract is to be covered by, and be in conformance with, the Standard Specifications as modified by The New York State Thruway Authority Addendum (TA) to the Standard Specification Books.

The officially adopted Thruway Authority Addendum (TA) to the NYSDOT Standard Specification Books is available on the Thruway Authority website at:

<http://www.thruway.ny.gov/business/addendum/index.html>

The most recent version of the TA, prior to the project Letting Date, shall apply to this agreement.

All special notes bound in this proposal shall be incorporated. If a conflict exists between the special specifications and/or provisions set forth in this proposal and the specifications and/or provisions set forth in the New York State Department of Transportation's Standard Specifications, those in the Proposal shall govern.

SPECIAL SPECIFICATIONS

SPECIAL NOTE
SPECIAL SPECIFICATION PAY ITEM NUMBERS

The Contractor's attention is directed to the special specification pay item formats used in this contract. Special specification pay items may be presented in two (2) different formats:

Format 1: Pay items for a special specification will have three (3) digits to the left of the decimal point and up to eight (8) digits to the right of the decimal. Spaces may appear in the third to sixth places after the decimal. The 7th and 8th digits to the right of the decimal will represent the origin of the specification.

Format 2: Pay items for a special specification will have three (3) digits to the left of the decimal point and up to eight (8) digits to the right of the decimal. Dashes may appear in the third to sixth places after the decimal. The 7th and 8th digits to the right of the decimal will represent the origin of the specification.

Where items in this contract appear in multiple formats, the formats shall be equated to each other as illustrated below:

FORMAT 1

XXX.XX XX
 XXX.XXXX XX
 XXX.XXXXXXXX

FORMAT 2

XXX.XX-----XX
 XXX.XXXX---XX
 XXX.XXXXXXXX

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SPECIFICATION SECTION	SECTION TITLE
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DIVISION 15 – MECHANICAL	
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DIVISION 16 – ELECTRICAL	
16050	Electrical
16160	Adjustable Frequency Drives
16721	Fire Alarm and Detection System
16725	Electronic Security Equipment

ITEM 627.0001 25**GENERAL REQUIREMENTS****1. DESCRIPTION:**

- 1.01 Furnish all labor, materials, equipment, and services necessary to complete the work as indicated on the Contract Plans and the attached Specification Summary.
- 1.02 All work shall conform to the requirements specified in Part 1 – General, of the Sections listed.

2. MATERIALS:

- 2.01 The materials shall be as specified in Part 2 – Products, of the Sections listed.

3. CONSTRUCTION DETAILS:

- 3.01 The construction details shall be as specified on Part 3 – Execution, of the Sections listed.

4. METHOD OF MEASUREMENT:

- 4.01 This item shall be measured for payment on a lump sum basis for the work completed in accordance with the Contract Documents and as directed by the Engineer.

5. BASIS OF PAYMENT:

- 5.01 Payment for this item shall be made at the lump sum bid price bid. The lump sum price bid shall include cost of furnishing all labor, material, equipment and appliances necessary to complete the work as indicated on the Contract Plans and as specified herein in the Sections listed.
- 5.02 Detailed Estimate:
 - A. Before the first certificate of payment is issued for the work under this item, submit a detailed estimate of quantities and prices for all materials, labor, and other items included under this item, which shall aggregate the contract lump sum price bid for this item. Prepare the detailed estimate in the same sequence as the Sections listed.
 - B. The detailed estimate shall be supported by such evidence, including certified copies of subcontracts, as the Engineer may require.
 - C. The detailed estimate must be approved by the Engineer who may revise it as, in his/her reasonable judgment, is necessary to make the various items conform to their true values. The value of each certificate of payment will be based on the approved detailed estimate.
- 5.03 Monthly payments will be made for this item in proportion to the total amount of work completed.

ITEM 627.0001 25 **GENERAL REQUIREMENTS****1. SPECIFICATION SUMMARY**

1.01 This Item includes the following specifications:

- A. Section 01010 Summary of the Work
- B. Section 01200 Project Meetings
- C. Section 01210 Allowances
- D. Section 01300 Submittals
- E. Section 01310 Project Schedules
- F. Section 01315 Critical Construction Activities
- G. Section 01355 Construction Waste Management and Disposal
- H. Section 01410 Special Inspection and Testing
- I. Section 01501 Temporary Utilities, Temporary Controls, and Construction Facilities
- J. Section 01610 General Equipment Requirements
- K. Section 01612 Shipping, Handling and Storage
- L. Section 01630 Piping Schedule
- M. Section 01650 Startup Requirements
- N. Section 01781 Operations and Maintenance Data
- O. Section 01800 Project Closeout
- P. Section 01821 Instruction of Operations and Maintenance Personnel

1.02 This item shall include, but not be limited to, the following:

- A. Requirements not found in the Standard Specification but an integral part of most building related construction projects.
- B. Description of the work included. Sequencing, special timing provisions, unique project concerns and the completion date.
- C. Requirements for electrical supply, water supply, temporary heat, shelter, sanitary facilities, lighting, etc.

1.03 Items specifically not paid for under this item shall include, but not be limited to, the following:

- A. Not Used

SECTION 01010 - SUMMARY OF THE WORK

PART 1 - GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

- A. The title and location of the Work is printed on the cover of this Document and / or the Drawing set.
- B. Contractor shall pay all necessary permit fees necessary to complete the work identified within the Contract Documents.
- C. Contractor shall pay utility company fees necessary to complete the work identified within the Contract Documents.

1.2 RELATED CONTRACTS

- A. The Project consists of one contract:

GENERAL CONSTRUCTION - CONTRACT NO. 1

The work of General Construction - Contract No.1 is indicated in the following Contract Documents:

- GC1. Drawings with the drawing number prefix "G", "C", "S", "SD", "A", "M", "H", "P", "E" and "I".
- GC2. All Division 1, 2, 3, 5, 7, 8, 10, 11, 13, 14, 15, 16 Specifications and Appendices.
- GC3. Addenda.

1.3 CONCURRENT PROJECTS

- A. The following projects will be taking place concurrently with the work of this project:

None.

1.4 RESTRICTED WORK PERIOD

Not Used.

1.5 ITEMS NOT INCLUDED

- A. The following items shown on the Drawings are not included in the Contract:

- 1. Items indicated "NIC" (Not in Contract).
- 2. Existing construction, except where such construction is to be removed, replaced, or altered.

1.6 CONFINED SPACE

- A. Comply with confined space and permit-required confined space as defined in Title 29, Part 1910, Section 146 of the Code of Federal Regulations (29CFR 1910.146).
- B. Indicated confined spaces are not intended to limit or define Contractor's or subcontractors' regulatory compliance requirements. In addition to confined spaces indicated on the drawings, other confined spaces may be present or created by the work of this contract. Notify the Owner's Representative, in writing, of confined spaces created or eliminated during execution of the Work.
- C. For the purpose of inspecting ongoing work, furnish at no additional cost to the Owner, personnel, as directed, to allow the Owner's Representative to enter confined space and permit-required confined space in compliance with Title 29, Part 1910, Section 146 of the Code of Federal Regulations (29CFR 1910.146).

1.7 CONTRACTOR USE OF PREMISES

- A. Work hours shall be as established by the Facility authorities thru the Owner's Representative.
- B. Inform the Owner's Representative of work area access requirements. The Owner's Representative will coordinate and schedule the requirements with Facility staff to obtain and ensure timely availability of work areas.
- C. Check in with the Facility Representative, as directed, at the beginning of each work day. Furnish information regarding where employees will be working during the day.
- D. Comply with the Facility's Visitor Identification Policy. A copy of the current policy will be distributed at the initial job meeting.
- E. The following items are not allowed on the Site or on Facility premises.
 - 1. Firearms, ammunition, weapons, and dangerous instruments (other than tools required for the Work).
 - 2. Alcoholic beverages and persons under the influence of same.
 - 3. Illegal controlled substances and persons under the influence of same.
- F. Comply with Facility policies relating to smoking at the Site.
- G. Routes of ingress and egress within the building to the location of the Work shall be as directed by the Owner's Representative.
- H. Store materials and perform the Work so that pedestrian and vehicular traffic is not obstructed.
- I. Do not diminish the level of life safety during performance of the Work.
- J. Furniture and portable equipment which interferes with execution of the Work will be removed and reset by Facility personnel.

- K. Utility Outages and Shutdowns: Do not interrupt utility services or branch services within the building except for the time required to make new connections. Arrange with the Owner's Representative for the time and duration of interruptions of services. Provide temporary services required to maintain building services at all times other than during scheduled interruptions.
- L. Be responsible and accountable for employees, suppliers, subcontractors and their employees, with regard to their use of the premises. Direct them to comply with the Facility Regulations and with the security and traffic regulations.
- M. Furnish Facility authorities with a telephone number or method to contact the supervisor for the Work in case of an emergency after work hours, including weekends and holidays.
- N. Comply with applicable federal and Owner of New York Right-to-Know Law provisions and supply copies of the appropriate Material Safety Data Sheets (MSDS) to the Owner's Representative, and to the Facility's Right-to-Know Information Officer.
- O. Direct employees to be watchful for people in or near the work area where safety hazards may be present. Notify the dispatcher in the Thruway Safety Operations Center (TSOC) at 1(800) 842-2233. The TSOC will dispatch the necessary response personnel. Contractor shall also notify the Thruway personnel identified on the emergency callout list prepared for the contract per NYSDOT standard specification section 107-05.
- P. Report fire and other emergency situations to the TSOC at 1(800) 842-2233 immediately. Contractor shall also notify the Thruway personnel identified on the emergency callout list prepared for the contract per NYSDOT standard specification section 107-05.

1.8 REFERENCE SPECIFICATIONS AND STANDARDS

- A. Comply with the requirements of the various specifications and standards referred to in these Specifications, except where they conflict with the requirements of these Specifications. Such reference specifications and standards shall be the date of latest revision in effect at the time of receiving bids, unless the date is given.
- B. DOT AND NYSTA Specifications: Where reference is made to the NYSDOT Standard Specifications, Standard Sheets, or Manuals, it shall mean the most current edition of the New York Owner Department of Transportation, Office of Engineering specifications entitled "STANDARD SPECIFICATIONS - CONSTRUCTION AND MATERIALS", including all applicable Addenda in effect at the time of receipt of bids.

All NYSDOT references shall be as modified by the New York State Thruway Authority (NYSTA) Addendum to the Standard Specifications, as well as applicable NYSTA Standard Sheets and requirements.

In the event of a conflict between NYSDOT and NYSTA requirements, NYSTA requirements shall govern.

1.9 LAYING OUT

- A. Verification. Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the project horizontal control and existing benchmarks. If discrepancies are discovered, notify the Owner's Representative promptly.

- B. General. Engage a NYS Licensed Professional Land Surveyor to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels as needed to locate each element of Project.
 - 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 3. Inform installers of lines and levels to which they must comply.
 - 4. Check the location, level and plumb, of every major element as the Work progresses.
 - 5. Notify the Owner's Representative when deviations from required lines and levels exceed allowable tolerances.
 - 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements. Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Record Log. Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference to the Owner's Representative.
- E. Reference Points. Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of the Owner's Representative. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to the Owner's Representative before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- F. Benchmarks. Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

1.10 SPECIAL INSPECTIONS

- A. Special Inspections and tests are required by Chapter 17 of the Building Code of New York State (BCNYS). Inspections & Testing Services will be provided by the Owner unless otherwise noted.
- B. Contractors are responsible for notifying the Owners Representative regarding individual inspections listed in the STATEMENT OF SPECIAL INSPECTIONS. Contractors shall cooperate with the inspectors and testing agencies and sufficient notice and lead time (minimum 48 hours) must be allowed for inspection and testing to be performed.
- C. Where deficiencies are identified, the contractor must take corrective actions to comply with the contract documents or remedy the deficiencies in accordance with Article 9 of the General Conditions

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION 01010

SECTION 01200 - PROJECT MEETINGS

PART 1 - GENERAL

1.1 PRECONSTRUCTION CONFERENCE

- A. Scheduled by Owner's Representative to occur within ten (10) days after the Notice to Proceed starts to run, but before any Work at the site is started, in accordance with the Contract Documents as applicable.
- B. Attendance
 - 1. Owner.
 - 2. Owner's Representative.
 - 3. Engineer.
 - 4. Contractor and job superintendent.
 - 5. Major subcontractors.
 - 6. Contractor's safety representative.
 - 7. Other interested parties as selected by the Owner or Engineer.
- C. Agenda
 - 1. Designation of responsible personnel representing the Owner, Owner's Representative, Contractors, Engineer and others, as appropriate.
 - 2. Distribution of Contract Documents as indicated in the Contract Documents if not previously distributed.
 - 3. Verification that required bonds and insurances have been provided.
 - 4. Discussion of any requirements for documenting existing conditions prior to disturbance.
 - 5. Discussion of Contract Times, starting, ending and Milestone dates, damages, and bonus & penalty provisions, if any.
 - 6. Verification that progress schedule, schedule of values and schedule of Submittals, Shop Drawings and Samples have been previously submitted, and discussion of status of each.
 - 7. Discussion of Project coordination, lines of communication and subcontractor relationships.
 - 8. Use of premises:

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Owner's requirements regarding ongoing operations.

Office and storage areas.

Temporary facilities and controls.

Temporary utilities.

Contractor's Work area.

Contractor's access and parking.

Work days and Work hours.

9. Procedures for:

Reporting and resolving discrepancies.

Submittals.

Substitutions and "or equal" Products.

Maintaining record documents.

Applications for payment.

Field Orders, Work Change Directives and Change Orders.

Partial Utilization, Substantial Completion and Contract closeout.

Emergencies.

Encountering hazardous materials.

Housekeeping.

Security.

Arranging utility outages.

Testing and prior notification.

Dispute resolution.

10. Permits.

11. Schedule for progress meetings and initial scheduling meeting.

12. Identification of pre-installation meetings required.

13. Discussion of specialty work, if any.

14. Discussion of progress schedule and critical Work sequencing.
15. Other items as appropriate. Contractor may add items to agenda by notifying Owner's Representative one week prior to scheduled conference.

1.2 SCHEDULING CONFERENCES

- A. Refer to Section 01310.

1.3 PROGRESS MEETINGS

- A. Scheduled at weekly intervals throughout the progress of work. Presided over by Owner's Representative.
- B. Attendance required:
 1. Owner.
 2. Owner's Representative.
 3. Engineer.
 4. Contractor and/or Job Superintendent.
 5. Subcontractors as pertinent to agenda.
 6. Suppliers and/or manufacturers' representatives as pertinent to agenda.
- C. Agenda:
 1. Review minutes of previous meetings.
 2. Review work progress.
 3. Discuss field observations, problems and decisions.
 4. Identification of problems that impede planned progress.
 5. Review of submittals schedule and status of submittals.
 6. Review of off-site fabrication and delivery schedules.
 7. Maintenance of progress schedule.
 8. Corrective measures to regain projected schedules.
 9. Planned progress during succeeding work period.
 10. Coordination of projected progress.
 11. Maintenance of quality and work standards.

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12. Status of proposed changes and any effect on progress schedule and coordination.

13. Other business relating to Work.

D. Minutes prepared by Owner's Representative and distributed to attendees. Should any attendee disagree with the contents of the minutes as prepared, they shall identify the information they feel is inaccurate and forward it, with corrections, to the author of the minutes, within 7 days of receipt of the minutes.

E. Location of Meetings: Job Site or Owner's Representatives offices.

1.4 PRE-INSTALLATION CONFERENCES

A. When required in individual specification sections, Contractor shall convene a pre-installation conference at the site prior to commencing Work of the section. Arrange sufficiently in advance to allow attendance by indicated parties.

B. Attendance:

1. Owner's Representative.

2. Engineer.

3. Contractors and Subcontractors directly affecting or affected by the work of the Section.

4. Material suppliers and/or manufacturers' representatives as required by the individual section.

C. Agenda:

1. Review conditions of installation.

2. Review preparation and installation procedures and coordination with related work.

D. Minutes prepared by Owner's Representative and distributed to all attendees. Should any attendee disagree with the contents of the minutes as prepared, they shall identify the information they feel is inaccurate and forward it, with corrections, to the author of the minutes, within 7 days of receipt of the minutes.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION 01200

SECTION 01210 - ALLOWANCES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Include in the contract sum the allowances stated in this Section.
- B. Should the net cost be more than the specified amount of the allowance, the contract sum will be adjusted by Change Order in accordance with the General Conditions. No Work in excess of the allowance will be permitted except by Change Order. Should the net cost be less than the specified amount of the allowance, the balance will be deducted from the final payment.

1.2 ALLOWANCES FOR CONTINGENCIES

- A. Include in the contract sum the amount to cover the cost of additional labor and materials for contingent activities within the scope of the Contract as directed in writing by Field Order. The Field Order will include a description of the Work and a method for determining the cost of such Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01210

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SECTION 01300 - SUBMITTALS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Schedule of Values
- B. Submittals
- C. Samples and Field Samples
- D. Manufacturers' Instructions
- E. Manufacturers' Certifications
- F. Contractor's Certifications
- G. Record Documents

1.2 SCHEDULE OF VALUES

- A. For each LUMP SUM BID ITEM, submit printed schedule on AIA Form G703 .
- B. Submit Schedule of Values in accordance with Article 2.6.3 of the General Conditions.
- C. Format: Utilize Table of Contents of this Project Manual. Identify each line item with number and title of Specification Section.
- D. Revise schedule to list approved Change Orders, with each Application for Payment.
- E. Also submit, as Owner's Representative may require, data to substantiate the accuracy of the schedule of values.
- F. After review by the Owner's Representative in accordance with Article 2.9 of the General Conditions, revise as necessary to make the schedule acceptable as to form and substance.

1.3 SUBMITTALS

- A. Shop Drawings and engineering data (submittals) covering all equipment and all fabricated components and building materials which will become a permanent part of the Work under this Contract shall be submitted to Owner's Representative for review, as required. Submittals shall verify compliance with the Contract Documents, and shall include drawings and descriptive information in sufficient detail to show the kind, size, arrangement, and the operation of component materials and devices; the external connections, anchorages, and supports required; the performance characteristics; and dimensions needed for installation and correlation with other materials and equipment.

Each submittal shall cover items from only one section of the specification unless the item

consists of components from several sources. Contractor shall submit a complete initial submittal including all components. When an item consists of components from several sources, contractor's initial submittal shall be complete including all components.

All submittals, regardless of origin, shall be approved by Contractor and clearly identified with the name and number of this Contract, Contractor's name, and references to applicable specification paragraphs and Contract Drawings. Each copy of all submittals, regardless of origin, shall be stamped or affixed with an approval statement of Contractor. Each submittal shall indicate the intended use of the item in the Work. When catalog pages are submitted, applicable items shall be clearly identified and inapplicable data crossed out. The current revision, issue number, and date shall be indicated on all drawings and other descriptive data.

Contractor shall be solely responsible for the completeness of each submittal. Contractor's stamp or affixed approval statement of a submittal, per Figure 01300-1, is a representation to Owner and Owner's Representative that Contractor accepts sole responsibility for determining and verifying all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data, and that Contractor has reviewed and coordinated each submittal with the requirements of the Work and the Contract Documents.

All deviations from the Contract Documents shall be identified as deviations on each submittal and shall be tabulated in Contractor's letter of transmittal using Figure 01300-1. Such submittals shall, as pertinent to the deviation, indicate essential details of all changes proposed by Contractor (including modifications to other facilities that may be a result of the deviation) and all required piping and wiring diagrams.

The Contractor shall submit shop drawings in either hard copy or electronically. All submittals shall be made with the selected method, and the Contractor shall inform the Engineer by letter one week after award of the Contract, which method has been selected. Submittals made by any method other than that selected by the Contractor, will be returned without review.

For hard copy submittals five copies of each drawing and the necessary data shall be submitted to Owner's Representative. Owner's Representative will return two marked copies (or one marked reproducible copy) to Contractor. Facsimile (fax) or electronic copies will not be acceptable. Owner's Representative will not accept submittals from anyone but Contractor. Submittals shall be consecutively numbered in direct sequence of submittal and without division by subcontracts or trades.

For electronic submittals, drawings and the necessary data shall be submitted electronically to Engineer as specified below. Submittal documents shall be in black and white unless color is required for the review of the submittal. All electronic files shall be in Portable Document Format (PDF) as generated by Adobe Acrobat Professional Version 7.0 or higher. The PDF file(s) shall be fully indexed using the Table of Contents, searchable with thumbnails generated. PDF images must be at a readable resolution. For most documents, they should be scanned or generated at 300 dots per inch (dpi). Optical Character Recognition (OCR) capture must be performed on these images so that text can be searched, selected and copied from the generated PDF file. The PDF documents shall have a bookmark created in the navigation frame for each major entry ("Section" or "Chapter") in the Table of Contents. Thumbnails shall be generated for each page or graphic in the PDF file.

The opening view for each PDF document shall be as follows:

Initial View: Bookmarks and Page

Magnification: Fit In Window

The file shall open to the Contractor's transmittal letter, with bookmarks to the left. The first bookmark shall be linked to the Table of Contents.

PDF document properties shall include the submittal number for the document title and the Contractor's name for the author.

Electronic submittal file sizes shall be limited to 10 MB. When multiple files are required for a submittal the least number of files possible shall be created.

B. ENGINEER'S REVIEW OF SUBMITTALS

Engineer's review of submittals covers only general conformity to the Drawings and Specifications, external connections, and dimensions that affect the layout; it does not indicate thorough review of all dimensions, quantities, and details of the material, equipment, device, or item covered. Engineer's review shall not relieve Contractor of sole responsibility for errors, omissions, or deviations in the drawings and data, nor of Contractor's sole responsibility for compliance with the Contract Documents.

Engineer's submittal review period shall be 14 consecutive calendar days and shall commence on the first calendar day following receipt of the submittal or resubmittal in Engineer's office. The time required to mail the submittal or resubmittal back to Contractor shall not be considered a part of the submittal review period.

When the drawings and data are returned with review status "REVISE AND RESUBMIT" or "REJECTED", the corrections shall be made as instructed by Engineer. Five corrected hard copies shall be resubmitted. Resubmittals by facsimile or e-mail will not be accepted. When the drawings and data are returned with review status "APPROVED", "APPROVED AS NOTED", no additional copies need be furnished unless specifically requested by Engineer.

C. RESUBMITTAL OF DRAWINGS AND DATA

Contractor shall accept full responsibility for the completeness of each resubmittal. Contractor shall verify that all corrected data and additional information previously requested by Engineer are provided on the resubmittal.

When corrected copies are resubmitted, Contractor shall direct specific attention to all revisions in writing and shall list separately any revisions made other than those called for by Engineer on previous submittals. Requirements specified for initial submittals shall also apply to resubmittals. Resubmittals shall bear the number of the first submittal followed by a letter (A, B, etc.) or a unique identification that indicates the initial submittal and correct sequence of each resubmittal.

If more than one resubmittal is required because of failure of Contractor to provide all previously requested corrected data or additional information, Contractor shall reimburse Owner for the charges of Engineer for review of the additional resubmittals. This does not include initial submittal data such as shop tests and field tests that are submitted after initial submittal.

Resubmittals shall be made within 30 days of the date of the letter returning the material to be modified or corrected, unless within 14 days Contractor submits an acceptable request for an extension of the stipulated time period, listing the reasons the resubmittal cannot be completed within that time.

The need for more than one resubmittal, or any other delay in obtaining Engineer's review of submittals, will not entitle Contractor to extension of the Contract Times unless delay of the Work is the direct result of a change in the Work authorized by a Change Order or failure of Engineer to review and return any submittal to Contractor within the specified review period.

D. COLOR SELECTION

Contractor shall submit samples of colors and finishes for all accepted products before Owner's Representative will coordinate the selection of colors and finishes with Owner. Owner's Representative will prepare a schedule of finishes that include the colors and finishes selected for both manufactured products and for surfaces to be field painted or finished and will furnish this schedule to Contractor within 60 days after the date of acceptance of the last color or finish sample.

Figure 01300-1

SUBMITTAL IDENTIFICATION &
CONTRACTOR'S APPROVAL STATEMENT

DATE: COPIES: DRAWING SHEET NO.:

PROJECT DESCRIPTION:

DESCRIPTION SUBMITTAL CONTENTS:

LOCATION:

MANUFACTURER:

SUBCONTRACTOR OR SUPPLIER (OPTIONAL):

REMARKS:

Deviations: ☐ None ☐ Yes (If Yes describe below.)

DEVIATIONS:

CONTRACTOR'S APPROVAL

(Contractor) has reviewed and coordinated the submitted documentation and verifies that the equipment and material meet the requirements of the Work and the Contract Documents. We accept sole responsibility for determining and verifying all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data contained in the submittal as required by the Contract Documents.

Approved By: Date:

Do not combine multiple sections together unless required by specifications.

1.4 SAMPLES AND FIELD SAMPLES

- A. Prepare and submit a preliminary schedule of sample and field sample submittals in accordance with the Contract Documents. After review by the Engineer for acceptability, make corrections and adjustments and resubmit acceptable schedule in accordance with the Contract Documents as applicable.
- B. Submit samples and prepare field samples in accordance with the Contract Documents as applicable.
- C. Unless otherwise noted in the individual Specification Sections, submit 2 samples and prepare 1 field samples of sufficient size and quantity to clearly illustrate:
 - 1. Functional characteristics of the product or assembly, with integral and related parts and fastening devices.
 - 2. Full range of color, texture and pattern of the product or assembly.
- D. Accepted samples establish the standards by which those portions of the Work represented by the samples will be judged.
- E. Samples are to become the property of the Engineer unless otherwise indicated in individual Specification Sections. Field samples shall not be included as part of the Work unless specifically allowed by the individual Specification Sections. Field samples shall be removed from the site by the Contractor upon completion of the Work.

1.5 MANUFACTURERS' INSTRUCTIONS

- A. When required in individual specification sections, submit manufacturer's printed instructions for delivery, storage, assembly, installation, start-up, adjusting and finishing, in quantities specified for shop drawings. Include special notices and Material Safety Data Sheets, if any, concerning hazards and safety precautions.

1.6 MANUFACTURERS' CERTIFICATIONS

- A. Submit two (2) copies of manufacturer's certifications when required in individual Specification Sections. Each copy shall bear manufacturer's original signatures and notarization seal.
- B. Certifications must refer to the specific project and must state that the product or equipment supplied to the project, or the system or assembly installed, meets or exceeds all referenced standards and the requirements of the Contract Documents.
- C. Product or equipment certifications are to arrive with the product or equipment. Items are not to be incorporated into the Work until satisfactory certifications are received by the Engineer.
- D. Where product or equipment certifications are required, no payments will be made for the stored items nor for installed items nor labor associated with their installation until satisfactory certifications are received by the Engineer.
- E. Where individual Specification Sections require certification of a system or assembly which

cannot be certified until after installation and/or operational testing have been completed; for example, a security system, energy management system, fire alarm system, pumping system, etc.; progress payments associated with that portion of the work shall be subject to a special retainage of ten percent (10%) of the value of the system or assembly, as indicated in the accepted Schedule of Values, in addition to any other retainage specified in the Contract. Contractor may apply for release of this special retainage in his next regular progress payment after submitting satisfactory certifications for the installed system or assembly.

1.7 CONTRACTOR'S CERTIFICATIONS

- A. Submit two (2) copies of Contractor certifications when required in individual Specification Sections. Each copy shall bear Contractor's original signatures and notarization seal.

1.8 RECORD DOCUMENTS

- A. Maintain and submit record documents in accordance with the Contract Documents as applicable.
- B. The Contractor shall obtain, at his own expense, two sets of full-size Contract Drawings for this purpose prior to the commencement of Work.
- C. Maintain accurate records of all authorized changes to the Contract Documents and deviations in the Work as it is actually installed, paying particular attention to dimensioning outside underground utility lines and other work which is concealed.
- D. Submit one current copy of record documents prior to Substantial Completion and a separate final copy upon final completion, as required by the Contract Documents. If Owner partially utilizes any portion of the project, Contractor shall submit a current copy of record documents for that portion being utilized, prior to acceptance of that portion as substantially complete.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION 01300

NEW YORK STATE THRUWAY AUTHORITY
NIAGARA PUMP HOUSE UPGRADE

C&S #185.026.004

SECTION 01310 - PROGRESS SCHEDULES

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

- A. Procedures for preparation and submittal of Construction Progress Schedules by the Contractor and periodical updating of same.
- B. Preparation and submittal of Master Progress Schedule by Contractor and periodic updating of same.

1.2 SUBMITTALS

- A. Preliminary Progress Schedule by Contractor.
- B. Master Progress Schedule prepared by Contractor.
- C. Periodic updates by all Contractors.
- D. Updated Master Progress Schedule prepared by Contractor.

1.3 PRELIMINARY PROGRESS SCHEDULE

- A. Contractor shall prepare and submit five (5) copies of a preliminary progress schedule in accordance with the Contract Documents as applicable.
- B. Submit in the form of a horizontal bar chart.
- C. Schedule shall show complete sequence of Contract work by activity, identifying work of separate stages and other logically grouped activities.
- D. Indicate anticipated starting and ending dates for each activity, as well as the dates for intermediate Milestones, Substantial Completion and Final Completion.

1.4 SCHEDULING CONFERENCE AND MASTER PROGRESS SCHEDULE

- A. After receipt of preliminary schedule, Owner's Representative will convene a scheduling conference involving the Owner, and Engineer for the purpose of discussing the preliminary schedule and agreeing upon corrections and adjustments to the individual schedules to define an acceptable Master Progress Schedule which will include the Work. Multiple meetings will be held if needed to reach a mutually agreeable schedule. Owner's Representative's limited review of schedules for acceptability will be in accordance with Contract Documents.
- B. Within 10 days after conclusion of scheduling conference(s), and at least 10 days before first Application for Payment by any Contractor, this Contractor shall submit the Master Progress Schedule, incorporating the agreed-upon corrections and adjustments. This Contractor shall distribute two (2) copies of Master Progress Schedule to the Owner, Owner's Representative, and Engineer.

NEW YORK STATE THRUWAY AUTHORITY
NIAGARA PUMP HOUSE UPGRADE

C&S #185.026.004

1.5 UPDATING SCHEDULES

- A. One week before submission of each Application for Progress Payment (or at a minimum of once per month, Contractor shall submit three (3) copies of marked-up Master Progress Schedule which shows current project status and all proposed future Work of the Contract. Updated progress schedules shall contain, for current and future work, the same level of detail and information contained in the initially accepted schedule and shall be in accordance with Contract Documents.
 - 1. Highlight activities modified since previous submittal, changes in scope, and other identifiable changes.
 - 2. Provide narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken or proposed, and its effect.
- B. Owner's Representative will distribute Contractors' marked-up Master Progress Schedules and narrative report and will review for acceptability in accordance with the Contract Documents as applicable.
- C. The Contractor shall maintain and revise Master Progress Schedule on a monthly basis, incorporating accepted revisions regarding current and future (not past) activities, and shall distribute copies of the updated Master Progress Schedule as indicated in Paragraph 1.5B of this

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION 01310

SECTION 01315 - CRITICAL CONSTRUCTION ACTIVITIES

SEQUENCE OF CONSTRUCTION. The following information provides a sequence for construction operations that must be phased and that the Contactor shall adhere to in preparing the proposed schedule of construction operations. Construction must begin with Critical Construction Activity 1 and progress sequentially unless otherwise approved by the Owner by written Change Order.

BYPASS PUMPING. The Contractor shall provide a minimum of 10,500 gpm of pumping capacity on site and in place to handle peak flows for all of the Contractor's work activities that require a portion existing treatment system to be taken out of service in any way. See Specification Section 02960 for addition bypass pumping requirements.

CRITICAL CONSTRUCTION ACTIVITY 1. – Controls Building and Site Improvements

- A. Remove the existing top asphalt drive and perform rough grading for site improvements. Install the steel retaining wall, block retaining wall, and rip rap swale as per the Drawings and Specifications.
- B. Construct the controls building and all equipment, underground utilities, and associated improvement and relocate the existing generator as per the Drawings and Specifications.

CRITICAL CONSTRUCTION ACTIVITY 2. – Decommissioning of the existing pump station and motor room.

- A. Dewater the existing wet well using bypass pumping and remove the existing suction strainers within the existing wet well sump and associated piping through the 4 existing wall penetrations. Provide temporary plugs for all four wall penetrations. Flows should enter the existing wet well as they do in existing conditions and bypass pumping should convey flows to the existing discharge manhole along the bike path.
- B. Provide demolition and improvements to the existing pump station as per the Drawings and Specifications.
- C. Provide all testing and startup services required for the pump station equipment as per the Drawings and Specifications.
- D. Remove the temporary plugs.

CRITICAL CONSTRUCTION ACTIVITY 3. – Project Completion

- A. Provide all other work of this Contract as per the Drawings and Specifications.

END OF SECTION 01315

SECTION 01355 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

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

1. Salvaging nonhazardous demolition and construction waste.
2. Recycling nonhazardous demolition and construction waste.
3. Disposing of nonhazardous demolition and construction waste.

1.2 DEFINITIONS

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

PART 2 - EXECUTION

2.1 SALVAGING DEMOLITION WASTE

- A. Comply with requirements in NYSDOT Standard Specification Volume 2, Section 202 – Demolition of Building and Structures for salvaging demolition waste.
- B. Salvaged Items for Reuse in the Work:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.

3. Store items in a secure area until installation.
4. Protect items from damage during transport and storage.
5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

C. Salvaged Items for Sale and Donation: Not permitted on Project site.

D. Salvaged Items for Owner's Use:

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

2.2 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.
- C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.
 1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 4. Store components off the ground and protect from the weather.
 5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor as often as required to prevent overfilling bins.

2.3 RECYCLING DEMOLITION WASTE

- A. Asphalt Paving: Grind asphalt to maximum 4-inch size.

- B. Asphalt Paving: Break up and transport paving to asphalt-recycling facility.
- C. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
- D. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
 - 1. Pulverize masonry to maximum 4-inch size.
 - 2. Clean and stack undamaged, whole masonry units on wood pallets.
- E. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- F. Metals: Separate metals by type.
 - 1. Structural Steel: Stack members according to size, type of member, and length.
 - 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- G. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.
- H. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- I. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
- J. Metal Suspension System: Separate metal members, including trim and other metals from acoustical panels and tile, and sort with other metals.
- K. Carpet: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
 - 1. Store clean, dry carpet in a closed container or trailer provided by carpet reclamation agency or carpet recycler.
- L. Carpet Tile: Remove debris, trash, and adhesive.
 - 1. Stack tile on pallet and store clean, dry carpet in a closed container or trailer provided by carpet reclamation agency or carpet recycler.
- M. Piping: Reduce piping to straight lengths and store by material and size. Separate supports, hangers, valves, sprinklers, and other components by material and size.
- N. Conduit: Reduce conduit to straight lengths and store by material and size.
- O. Lamps: Separate lamps by type and store according to requirements in 40 CFR 273.

2.4 RECYCLING CONSTRUCTION WASTE

- A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

D. Paint: Seal containers and store by type.

2.5 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged or recycled, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. General: Except for items or materials to be salvaged or recycled, remove waste materials and legally dispose of at designated spoil areas on Owner's property.

C. Burning: Do not burn waste materials.

END OF SECTION 01355

SECTION 01410 - SPECIAL INSPECTION AND TESTING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Special Inspection and Structural Testing shall be in accordance Chapter 17 of the Building Code of New York State 2025 (BCNYS).
- B. The program of Special Inspection and Structural Testing is a quality assurance program intended to ensure that the work is performed in accordance with the Contract Documents.
- C. This specification section is intended to inform the Contractor of the Owner's quality assurance program and the extent of the Contractor's responsibilities.

1.2 RELATED DOCUMENTS

- A. Statement of Special Inspections and Tests (attached)

1.3 SCHEDULE OF INSPECTION AND TESTS

- A. Required inspections and tests are described herein and in the individual specification Sections for the items to be inspected or tested.
- B. An Independent Testing Laboratory (ITL) will be retained by the Owner. The Special Inspector, his agents and the ITL shall perform, but not be limited to, the following project testing and inspection services:
 - (a.) Structural Steel.
 - (b.) Cold-formed steel deck.
 - (c.) Open-web steel joists and joist girders.
 - (d.) Cold-formed steel trusses spanning 60 feet or greater.
 - (e.) Concrete.
 - (f.) Masonry.
 - (g.) Wood.
 - (h.) Soils.
 - (i.) Driven deep foundations.
 - (j.) Cast-in-place deep foundations.
 - (k.) Helical pile foundations.
 - (l.) Fabricated items.
 - (m.) Special inspections for wind resistance.
 - (n.) Special inspections for seismic resistance.
 - (o.) Testing for seismic resistance.
 - (p.) Sprayed fire-resistant materials.
 - (q.) Mastic and intumescent fire-resistant coatings.
 - (r.) Exterior insulation and finish systems (EIFS).
 - (s.) Fire-resistant penetrations and joints.

(t.) Testing for smoke control.

1.4 ITL TESTING AND INSPECTION FREQUENCY

- A. Specific items to be tested and the frequency as to which the tests are to be performed are as noted in this Specification Section on the attached "Statement of Special Inspections and Tests."

1.5 PAYMENT

- A. The Owner shall engage and pay for the services of the Special Inspector, Agents of the Special Inspector, and Testing Laboratory.
- B. The Contractor shall be responsible for the cost of any retesting or reinspection of work which fails to comply with the requirements of the Contract Documents

1.6 CONTRACTOR'S RESPONSIBILITIES

- A. Contractor shall cooperate with the Special Inspector, his agents, the ITL and the Engineer to facilitate the execution of required services.
- B. Contractor is responsible for coordinating his work with the Engineer and ITL so that no work is installed without the proper tests being performed.
- C. Contractor shall secure for the ITL, where required, quantities of samples of materials to be tested.
- D. Contractor shall furnish casual labor and facilities for storage of test samples.
- E. Contractor shall assist ITL to obtain samples at job site.
- F. Contractor shall provide concrete plant mix certifications.
- G. Contractor shall provide certified mill reports for project reinforcing and structural steel covering physical and chemical properties.
- H. Contractor shall advise ITL, in advance, of sources of material, and instruct supplier to cooperate with ITL to achieve required inspection.
- I. Contractor shall notify the ITL a minimum of 24 hours in advance of operations to allow for ITL assignment of personnel and scheduling of test. If ITL visits site and tests cannot take place, Contractor shall reimburse the Owner for total cost.
- J. Contractor shall provide mortar and grout mix plant mix designs.
- K. Contractor shall notify ITL 24 hours before each concrete pour and identify the proposed quantity of the pour.
- L. The Engineer shall keep at the project site the latest set of construction drawings, field sketches, approved shop drawings, and specifications for use by the inspectors and testing technicians.

- M. The Special Inspection program shall in no way relieve the Contractor of his obligation to perform work in accordance with the requirements of the Contract Documents or from implementing an effective Quality Control program. All work that is subjected to Special Inspections shall first be reviewed by the Contractor's quality control personnel.
- Q. The Contractor shall be solely responsible for construction site safety.
- R. Contractor's responsibility related to project testing as required by technical sections hereinafter:
 - 1. The Contractor shall provide advanced notice (7 days) when Special Inspection is required so the Engineer can schedule the Inspection Service.
 - 2. The Contractor shall obtain from governing authorities the proper test procedures that are required for the system tests.
 - 3. All tests shall be made in the presence of the Engineer and the Contractor. The Inspection Service shall provide five (5) copies of test data and results to the Engineer.
 - 4. See technical sections hereinafter for further details of testing requirements.

PART 2 PRODUCTS (Not used)

PART 3 EXECUTION

3.1 TESTING REQUIREMENTS

- A. General
 - 1. Testing shall be by the Special Inspector and Testing Laboratory and its agents, unless noted otherwise herein.
 - 2. Owner's providing and use of testing services shall in no way relieve the Contractor of their responsibility to furnish materials and construction in full compliance with drawings and specifications.
- B. Masonry
 - 1. Provide periodic inspection for the following items: construction of the mortar joints; verify type, size and location of all anchorage; protective measures for cold weather construction; and verify grout spaces clean and clear prior to grouting.
 - 3. Take three mortar cylinders for each 5,000 square feet of masonry veneer wall surface and for each 2,000 square feet of load bearing masonry wall surface. One cylinder shall be tested at 7 days and two cylinders shall be tested at 28 days per specified ASTM requirements.

4. Take three grout cubes for each 100 cubic yards, or fraction thereof, of grout. One cube shall be tested at 7 days and two cubes shall be tested at 28 days per specified ASTM requirements.
5. Take three sets (3 prisms each) of masonry prisms (load bearing walls) at least 28 days prior to the start of masonry work and one set for each 5,000 square feet of wall surface, per specified ASTM requirements. Test per specified ASTM requirements, modified so that one prism from each of the sets fabricated prior to the start of masonry is tested at 7, 14, and 28 days.
6. Provide periodic inspection of application of exterior masonry waterproofing and/or stain. Verify the purchase of sufficient quantity of material for proper coverage.
7. Provide daily check that mortar and grout are being placed in final position within 2-1/2 hours and retempering will not be permitted.
8. Provide daily inspection of the placement and size of reinforcing bars at load bearing walls.
9. Provide daily check of placement of metal ties at masonry veneer walls.

C. Concrete

1. The Testing Laboratory services shall include: daily inspection of concrete placement; testing for air content, slump and strength out of the same batch of fresh concrete; laboratory curing of test specimens; test for compressive strength made on cured test specimens; also include furnishing of cylinder molds.
2. Minimum of one compression strength test for each 50 cubic yards and/or each 5,000 square feet of floor slab placed on each class of concrete being used, but not less than one test for each day's work. Each test is comprised of six (6) test cylinder specimens, with additional tests required whenever there is a change in consistency, materials or temperature. These specimens shall be made and cured in accordance with ASTM C31.
3. Take slump test in accordance with ASTM C143. The minimum slump tests required are one slump test at the beginning of each day's pour and an additional test when test cylinders are made or whenever there is a change in formulation or materials of the mix.
4. Check and note temperature of the concrete.
5. Provide periodic inspection of curing procedures for concrete floor slabs.
6. Observe and approve the addition of water or other additives to the approved mix after the concrete truck leaves the batch plant.
7. Continuous Inspection of bolts to be installed in concrete prior to and during placement

8. Testing Laboratory shall be responsible for proper handling of test cylinders including transfer to testing laboratory. Contractor shall provide adequate approved facilities on project site for proper storing and curing of test cylinders in accordance with ASTM C31 for the first 24 hours after which same shall be transferred.
9. Test specimens in accordance with ASTM C39. Two cylinders shall be tested at 7 days, two at 28 days, and two shall be kept as a spare. In case of questionable or unsatisfactory results, the remaining cylinders shall be broken at 40 days or as directed by the Engineer.
10. Slump exceeding the specified maximum, when occurring in two consecutive tests made on different portions of the same sample, will be cause for rejection.
11. Provide the following air content tests:
 - a. First load delivered for each segment of the construction project, such as caissons, columns, walls, slabs, retaining walls, planters, etc., shall be tested by a representative of testing and inspection laboratory using ASTM air meter equipment and procedures. Slump test and strength test shall be made by testing laboratory representative from the same batch of concrete as used for air test.
 - b. Air indicator readings shall be taken from same load to validate use of air indicator readings.
 - c. Air indicator tests shall be made on the first load delivered in the morning and afternoon until segment of the project is completed and also when any change in consistency or appearance of the concrete so suggests.
 - d. Air indicator tests shall also be made on samples of screeded and floated-in-place concrete as are necessary to give assurance that handling, compacting and finishing methods employed by Contractor do not result in an unwarranted reduction in the air content of concrete. If air content of floated concrete is indicated to be more than one half of one percent less than that indicated by the compaction test on sample taken at the delivery chute, Contractor shall at once take steps to correct, revising his procedures as may be necessary.
 - e. Measure air content in accordance with ASTM
12. Additional testing shall be required if 28-day test cylinders show strengths less than that which is required on this project. Cost of these tests shall be borne by Contractor and may include breaking spare test cylinders, core tests and load tests, also use of mechanical, electrical or electronic testing devices. Any of the foregoing tests shall be done only by specific authorization and direction of Engineer.
13. Additional testing shall also be required if there is evidence of faulty workmanship, frozen concrete, or any violation of project requirements and these tests shall be as directed by the Engineer.

14. Any non-compliance with project requirements will be duly reported. These reports will completely describe mix tested, location of pour, weather and other pertinent data.
15. To facilitate concrete testing services, the Contractor shall:
 - a. Secure and deliver to the Engineer, without cost, preliminary representative samples of materials he proposes to use and which are required to be tested.
 - b. Submit to the Engineer, the concrete mix design and confirming compression test results proposed for use, and make written request for approval.
 - c. Furnish such casual labor as is necessary to obtain and handle samples at the project or at other sources of materials.
 - d. Advise the testing laboratory sufficiently in advance of operations to allow for completion of quality tests and for the assignment of personnel.
 - e. Provide and maintain for the sole use of testing laboratory, adequate facilities for safe storage and proper curing of concrete test cylinders on project site for the first 24 hours as required by ASTM C31.
 - f. Furnish copies of mill test reports of all shipments of cement and reinforcing steel to the engineer and the testing laboratory as required.
17. Test results obtained by use of an impact hammer or sonoscope, unless correlated with other test data, shall not be considered conclusive in evaluating strengths of concrete.

D. Reinforcing Steel

1. Periodically inspect the placement, spacing, and size of reinforcing bars before concrete and masonry placement.

3.3 FINAL REPORT OF SPECIAL INSPECTIONS

- A. The Final Report of Special Inspections shall be completed by the Special Inspector and /or the Testing Laboratory and be submitted to the Engineer prior to issuance of an Acceptance. The Engineer shall provide a copy of the Final Report of Special Inspections to the Owner.

Statement of Special Inspections and Tests						
INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BCNYS)	CONTINUOUS	PERIODIC	REFERENCE STANDARD	BCNYS REFERENCE (TABLE)	CHECK IF REQUIRED	IDENTIFY SECTION IN SPEC 01410 AND CLARIFYING NOTES
A. Steel Construction				(Table 1704.3)	☐	3.1H (unless noted otherwise)
1. Material verification of high-strength bolts, nuts, and washers.		X	Applicable ASTM specifications. AISC ASD, Section A3.4	1704.3	☐	
2. Inspection at Fabrication Shop		X	ASTM Specs	1704.2	☐	
3. Inspection of high strength bolting.	X	X		1704.3.3	☐	
4. Material verification of structural steel.		X	ASTM A6 or A568	1704.3	☐	
5. Material verification of weld filler materials		X	AISC, ASD, Section A3.6	1704.3	☐	
6. Inspection of structural steel welding.	X		AWS D1.1, D1.3, D1.4; ACI 318:3.5.2	1704.3, 1704.3.1	☐	
7. Inspection of steel frame joint details.		X		1704.3, 1704.3.2	☒	
8. Steel joists & girders field erection.	X			1704.3.2	☒	3.1I
9. Metal roof & floor deck erection.		X		1704.3, 1704.3.1	☐	3.1J
B. Concrete Construction				(Table 1704.4)	☐	3.1E (unless noted otherwise)
1. Inspection of reinforcing steel, including prestressing tendons, and placement		X	ACI 318: 3.5, 7.1-7.7	1704.4, 1903.1, 1907,	☒	3.1F
2. Inspection of reinforcing steel welding.	X		AWS D1.4; ACI 318: 3.5.2	1704.4; (Table 1704.3)	☐	3.1F
3. Inspection of bolts to be installed in concrete prior to and during placement.	X			1704.4, 1912.1	☐	
4. Verify use of required design mix.		X	ACI 318: Ch. 4, 5.2- 5.4	1704.4, 1904, 1905.2- 1905.4, 1913.2, 1913.3	☒	
5. Sampling fresh concrete: slump, air content, temperature, strength test	X		ASTM C 172, C 173, C 231, C 31; ACI 318: 5.6, 5.8	1704.4, 1905.6, 1913.10	☒	

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specimens.						
6. Inspection of placement for proper application techniques.	X		ACI, 318: 5.9, 5.10	1704.4, 1905.9, 1905.10, 1913.6, 1913.7, 1913.8	☒	
7. Inspection for maintenance of specified curing temperature and techniques.		X	ACI, 318: 5.11, 5.13	1704.4, 1905.11-1905.13, 1913.9	☒	
8. Inspection of prestressed concrete.	X		ACI 318: 18.18, 18.16.4	1704.4	☐	
9. Erection of precast concrete members.		X	ACI 318: Ch. 16	1704.4	☐	3.1G
10. Verification of in-situ concrete strength prior to stressing of tendons and prior to removal of shores and forms from beams and slabs.		X	ACI 318: 6.2	1704.4, 1906.2	☐	
C. Masonry Construction			ACI 530/ASCE 5/TMS 402	ACI 530.1/ASCE 6/TMS 602	(Table 1704.5.1 & 1704.5.3)	3.1D (unless noted otherwise)
1. Verify to ensure compliance:						
a. Proportions of site prepared mortar and grout		X		2.6A	1704.5	☐
b. Placement of masonry units and construction of mortar joints.		X		3.3B	1704.5	☐
c. Location and placement of reinforcement, connectors, tendons, anchorages.		X	1.12.3	3.4, 3.6A	1704.5	☐
d. Prestressing technique and installation.		X		3.6A, 3.6B	1704.5	☐ 3.1F
e. Grade and size of tendons and anchorages.		X		2.4B	1704.5	☐ 3.1F
2. Inspection shall verify:					1704.5	☐
a. Size and location of structural elements.		X		3.3G	1704.5	☐
b. Type, size, and location of anchors.		X	1.15.4, 2.1.2		1704.5	☐
c. Specified size, grade, location and type of reinforcement.	X	X	1.12	2.4, 3.4	1704.5	☐
d. Welding of reinforcing bars.	X		2.1.8.6, 2.1.8.6.2		1704.5, 2108	☐ AWS D1.4, ACI 318:3.5.2

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e. Cold/hot weather protection of masonry construction.		X		1.8	1704.5, 2104.3, 2104.4	☐	
f. Prestressing force measurement and application.	X			3.6B	1704.5	☐	31.F
3. Inspection prior to grouting a) Grout spaces are clean b) Proportions of grout c) Construction of mortar joints		X X X X	1.12	3.2D, 3.4	1704.5	☐	3.1F
4. Grout placement.	X			3.5	1704.5	☐	3.1F
5. Preparation of grout specimens, mortar specimens, and/or prisms.	X			1.4	1704.5	☐	
6. Compliance with documents and submittals.		X		1.5	1704.5	☐	
D. Wood Construction: Fabrication of wood structural elements and assemblies in shop and field.		X			1704.6, 1704.2, 1707.3, 2303.1.4 2303.4	☐	
E. Soils					(Table 1704.7)	☐	3.1B Reference approved soils report as required by 1802.2
1. Verify Materials below footings are adequate to achieve design bearing capacity		X			1704.7	☒	
2. Verify excavations are extended to proper depth and have reached proper material		X			1704.7	☒	
3. Perform classification and testing of controlled fill materials		X	ASTM D 1557 ASTM D 698		1704.7	☐	Not required if controlled fill is equal to or less than 12 inches
4. Verify use of proper materials, densities and lift thickness during placement and compaction of controlled fill	X		ASTM D 1557, ASTM D 698		1704.7	☒	
5. Prior to placement of controlled fill, observe subgrade and verify that site has been prepared properly.		X	ASTM D 2488		1704.7	☒	
F. Pile Foundations:		X			(Table 1704.8)	☐	3.1C Reference approved soils report as required by 1802.2
1. Verify pile materials, sizes and lengths comply with the requirements.	X				1704.8	☐	

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2. Determine capacities of test piles and conduct additional load tests, as required	X		ASTM D 1143, ASTM D 4945, ASTM D 3639	1704.8	☐	
3. Observe driving operations and maintain complete and accurate records for each pile	X			1704.8	☐	
4. Verify placement locations and plumbness, confirm type and size of hammer, record number of blows per foot of penetration, determine required penetrations to achieve design capacity, record tip and butt elevations and document any pile damage.	X			1704.8	☐	
5. For steel piles perform additional inspections in accordance with Section 1704.3	X			1704.8	☐	
6. For concrete piles and concrete-filled piles perform additional inspections in accordance with Section 1704.4	X			1704.8	☐	
7. For specialty piles perform additional inspections as determined by registered design professional in charge	X			1704.8	☐	
8. For augered uncased piles and caisson piles perform additional inspections in accordance with Section 1704.9	X			1704.8	☐	
G. Pier Foundations:				(Table 1704.9)	☐	3.1C Reference approved soils report as required by 1802.2
1. Observe drilling operations and maintain complete and accurate records for each pier	X			1704.9	☐	
2. Verify placement locations and plumbness, confirm per diameters, bell diameters (if applicable), lengths, embedment into bedrock (if applicable), and adequate end bearing strata capacity.	X			1704.9	☐	

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3. For concrete piers, perform additional inspections in accordance with section 1704.4	X			1704.9	☐	
4. For masonry piers, perform additional inspections in accordance with section 1704.5	X			1704.9	☐	
H. Mastic and Intumescent fire-resistant coatings			AWCI-12B	1704.11	☐	
I. Exterior Insulation and Finish Systems (EIFS)				1704.12	☐	
J. Special Cases				1704.13	☐	
K. Smoke Control				909.18.8.1 1704.14	☐	
L. Special Inspections for Seismic Resistance: Applicable to specific structures, systems, and components.						
1. Structural steel	X		AISC Seismic	1707.2	☐	
2. Structural wood.	X			1707.3	☐	
3. Cold-formed steel framing.		X		1707.4	☐	
4. Pier Foundation		X		1707.5	☐	
5. Storage racks and access floors.		X		1707.6	☐	
6. Architectural components.		X		1707.7	☐	
7. Mechanical and electrical components.		X		1707.8	☐	
8. Designated Seismic System Verification		X		1707.9	☐	
9. Seismic isolation system.		X		1707.10	☐	
M. Structural Testing for Seismic Resistance: Applicable to specific structures, systems, and components.						
1. Testing and verification of masonry materials and assemblies.				1708.1	☐	
2. Testing for seismic resistance.				1708.2	☐	
3. Reinforcing and prestressing steel.			ACI 318	1708.3, 1903.5.2	☐	
4. Structural steel.			AISC Seismic	1708.4	☐	
5. Mechanical and electrical equipment.				1708.5	☐	
6. Seismically isolated structures.				1708.6, 1623.8	☐	
N. Structural Observations: Applicable to specific structures.				1709.1	☐	

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O. Test Safe Load				1712.1	☐	
P. In-Situ Load Tests				1713.1	☐	
Q. Preconstruction Load Tests				1714.1	☐	
R. Foundation and Soil Investigations						
1. Questionable soil.				1802.2.1	☐	
2. Expansive soils.				1802.2.2	☐	
3. Groundwater table.				1802.2.3	☐	
4. Pile and pier foundations.				1802.2.4	☐	
5. Rock strata.				1802.2.5	☐	
6. Seismic Design Category C.				1802.2.6	☐	
7. Seismic Design Category D, E, F				1802.2.7	☐	
S. Soil Classification			ASTM D2488	1802.3	☐	
T. Other (List)						

END OF SECTION 01410

SECTION 01501 - TEMPORARY UTILITIES, TEMPORARY CONTROLS AND CONSTRUCTION FACILITIES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide temporary utilities, temporary controls and construction facilities necessary for the Work and as indicated herein. Unless specified otherwise the work specified in this Section is to be performed by all Contracts.
1. The construction facilities and temporary controls specified to be provided by a particular Contract shall be kept operational by that Contractor for the Work of all related Contracts at all times Work is being performed by a Contractor.
 2. The construction facilities and temporary controls specified to be provided by a particular Contractor shall be installed as soon after award of the Contract as necessary to enable the Work of each Contract to proceed on schedule, and maintained until completion of the Work of all related Contracts unless otherwise directed in writing.
 3. Any Contractor who requires additions to the construction facilities and temporary controls specified to be provided by another Contractor shall provide and maintain them.

1.2 TEMPORARY LIGHT AND POWER

A. General Contractor (Contract No. 1)

1. Make necessary arrangements with the local electrical utility company for the installation of a 200 ampere, single phase, 120 / 240 volt temporary electrical service to the site of the Pump Station Construction. Pay all utility company charges.
2. Provide a pole line for temporary light and power. Install minimum Class 4 poles of height required to maintain at least 25 feet ground clearance under wires. Space wires on cross arms to suit voltage.
3. Install branch circuits with fused grounding type receptacle outlets for single phase power (for power tools, etc.).

B. General Contractor (Contract No. 1)

1. Any Contractor requiring additional lighting shall provide additional fluorescent fixtures or incandescent lamp holders (with lamps), but in no case shall the load on any branch circuit or feeder exceed its rated capacity.
2. Install materials for temporary light and power in conformance with the National Electrical Code.

3. Materials for temporary light and power need not be new if they are in satisfactory operating condition.
4. Provide ground-fault protection for personnel (such as portable plug-in type ground-fault circuit-interrupters) on single phase 15 and 20 ampere receptacle outlets which are in use.
5. Receptacle outlets, portable cord connectors and attachment plugs shall have standard NEMA configurations.
6. As the progress of the Work allows, and as approved, completed portions of the permanent wiring and electrical service may be utilized for temporary light and power.

1.3 TEMPORARY WATER

- A. Water will be made available by the Owner for the Work without charge at source or sources directed within the limits of the existing supply and usage. The Contractor shall provide any transportation and / or temporary piping from the Owner's existing water source to the point of use and / or site of the Work.
- B. All Contracts: Prevent waste of water.

1.4 TEMPORARY TOILETS.

- A. General Contractor (Contract No. 1). Provide portable, chemical-type toilet facilities for Contractor's and subcontractors employees engaged on the Project, including employees of other contractors. Locate toilets where directed and maintain them in a sanitary condition.

1.5 TEMPORARY CLOSURES FOR EXTERIOR WALL OPENINGS

- A. General Contractor (Contract No. 1)
 1. Whenever necessary, after the building is enclosed, to maintain proper temperatures for the performance of the Work, provide and maintain temporary closures for all openings in exterior walls that are not closed with permanent materials.
 2. During the period when plastering is being done and continuing thereafter until the plaster is properly cured, provide exterior window and door openings with temporary closures, regardless of the time of year.
 3. Construct temporary closures of 2 x 4 framing sheathed with plywood, waferboard, or 6 mil polyethylene attached to wood frames, as approved and to suit job requirements.
 4. Provide closures so that they will afford convenient means of entrance and exit for persons having business within the building, afford ample light to permit continued progress of the Work, and exclude inclement weather.

1.6 PROTECTION OF WORK AND EXISTING PROPERTY. Contractor shall protect, shore, brace, support, and maintain all underground pipes, conduits, drains, and other underground

construction uncovered or otherwise affected by its construction operations. All pavement, surfacing, driveways, curbs, walks, buildings, utility poles, guy wires, fences, and other surface structures affected by construction operations, together with all sod and shrubs in yards, parkways, and medians, shall be restored to their original condition, whether within or outside the easement. All replacements shall be made with new materials.

Contractor shall be responsible for all damage to streets, roads, highways, shoulders, ditches, embankments, culverts, bridges, and other public or private property, regardless of location or character, which may be caused by transporting equipment, materials, or workers to or from the Work or any part or site thereof, whether by Contractor or its Subcontractors. Contractor shall make satisfactory and acceptable arrangements with the owner of, or the agency or authority having jurisdiction over, the damaged property concerning its repair or replacement or payment of costs incurred in connection with the damage.

- A. Protect installed Work and existing property during performance of the Work.
 - B. Maintain the building in a watertight condition during performance of the Work.
 - C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
 - D. Provide protective coverings at wall projections, jambs, sills, and soffits of openings.
 - E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, and movement of heavy objects by covering them with durable sheet materials.
 - F. Prohibit traffic or storage upon waterproofed and roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
 - G. Protect existing trees and plants during performance of the Work unless otherwise indicated. Box trees and plants within the grading limit lines. Do not deposit excavated materials or store building materials around trees or plants. Do not attach guy wires to trees.
 - H. Prohibit traffic from landscaped areas.
- 1.7 WATER CONTROLS. Provide and maintain pumping equipment necessary to keep the work areas free from water. Discharge water into existing storm drainage systems or otherwise disperse as directed.
- 1.8 FIRE PREVENTION
- A. Take precautions necessary to prevent fires.
 - B. Fuel for cutting and heating torches shall be acetylene or LP-gas only, and shall be contained in Underwriters Laboratory or Federal Department of Transportation approved containers.
 - C. Furnish and maintain a currently inspected 20 pound capacity multi-class ABC fire extinguisher in the immediate vicinity where welding tools or torches are in use.

- D. Do not use flammable liquids, other than those specified, within a building without the written approval from the Owner's Representative.
- E. Tarpaulins shall be flameproof and shall be securely anchored when attached to scaffolding or when used to enclose any portion of a building.

1.9 ACCESS ROADS

- A. Routes of ingress and egress on the premises to the location of the work areas shall be as directed.
- B. Keep designated access roads clear of dirt and debris resulting from the Work.
- C. Provide means of removing mud from vehicle wheels before entering paved roads.

1.10 PARKING. Park vehicles in areas where directed.

1.11 RUBBISH REMOVAL

- A. Clean up and containerize the rubbish (refuse, debris, waste materials, and removed materials and equipment) resulting from the Work at least once a day and more often if the rubbish interferes with the work of others or presents a hazard. Leave work areas broom clean, except where more stringent cleaning is specified, at the end of each day. Locate containerized rubbish on the Site where directed.
 - 1. Burning of rubbish will not be permitted.
- B. Remove rubbish from State property at least once a week and more often if the rubbish presents a hazard. Properly dispose of rubbish.

1.12 RELOCATION AND REMOVALS

- A. Should a change in location of any construction facilities and temporary controls be necessary in order to progress the Work properly, remove and relocate such items as directed.
- B. Remove the construction facilities and temporary controls when they are no longer required. Restore permanent facilities used for or connected to temporary facilities to their original condition or better.

1.13 MAINTENANCE OF TRAFFIC

- A. Contractor shall conduct its work to interfere as little as possible with public travel, whether vehicular or pedestrian. Whenever it is necessary to cross, obstruct, or close roads, driveways, and walks, whether public or private, Contractor shall provide and maintain suitable and safe bridges, detours, or other temporary expedients for the accommodation of public and private travel, and shall give reasonable notice to owners of private drives before interfering with them. In making open-cut street crossings, Contractor shall not block more than one-half of the street at a time. Whenever possible, Contractor shall widen the shoulder on the opposite side to facilitate traffic flow. Temporary surfacing shall be provided as necessary on shoulders.

- B. Detours. Where required by the authority having jurisdiction thereover that traffic be maintained over any construction work in a public street, road, or highway, and the traffic cannot be maintained on the alignment of the original roadbed or pavement, Contractor shall, at its own expense, construct and maintain a detour around the construction work. Each detour shall include a bridge across the pipe trench and all necessary barricades, guardrails, approaches, lights, signals, signs, and other devices and precautions necessary for protection of the Work and safety of the public.
- C. Barricades And Lights. All streets, roads, highways, and other public thoroughfares which are closed to traffic shall be protected by effective barricades on which shall be placed acceptable warning signs. Barricades shall be located at the nearest intersecting public highway or street on each side of the blocked section.

All open trenches and other excavations shall have suitable barricades, signs, and lights to provide adequate protection to the public. Obstructions, such as material piles and equipment, shall be provided with similar warning signs and lights.

All barricades and obstructions shall be illuminated with warning lights from sunset to sunrise. Material storage and conduct of the Work on or alongside public streets and highways shall cause the minimum obstruction and inconvenience to the traveling public.

All barricades, signs, lights, and other protective devices shall be installed and maintained in conformity with applicable statutory requirements and, where within railroad and highway rights-of-way, as required by the authority having jurisdiction thereover.

- 1.14 NOISE CONTROL. Contractor shall take reasonable measures to avoid unnecessary noise. Such measures shall be appropriate for the normal ambient sound levels in the area during working hours. All construction machinery and vehicles shall be equipped with practical sound-muffling devices, and operated in a manner to cause the least noise consistent with efficient performance of the Work. During construction activities on or adjacent to occupied buildings, and when appropriate, Contractor shall erect screens or barriers effective in reducing noise in the building and shall conduct its operations to avoid unnecessary noise which might interfere with the activities of building occupants.
- 1.15 DUST CONTROL. Contractor shall take reasonable measures to prevent unnecessary dust. Earth surfaces subject to dusting shall be kept moist with water or by application of a chemical dust suppressant. When practicable, dusty materials in piles or in transit shall be covered to prevent blowing dust. Buildings or operating facilities which may be affected adversely by dust shall be adequately protected from dust. Existing or new machinery, motors, instrument panels, or similar equipment shall be protected by suitable dust screens. Proper ventilation shall be included with dust screens.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01501

SECTION 01610 - GENERAL EQUIPMENT REQUIREMENTS

PART 1 – GENERAL

- 1.1 SCOPE. When an equipment Specification Section in this Contract references this Section, the equipment shall conform to the general requirements set forth in this Section, except as otherwise specified in other Sections.
- 1.2 COORDINATION. Contractor shall coordinate all details of the equipment with other related parts of the Work, including verification that all structures, piping, wiring, and equipment components are compatible. Contractor shall be responsible for all structural and other alterations in the Work required to accommodate equipment differing in dimensions or other characteristics from that contemplated in the Contract Drawings or Specifications.
- 1.3 MANUFACTURER'S EXPERIENCE. Unless specifically named in the Specifications, a manufacturer shall have furnished equipment of the type and size specified which has been in successful operation for not less than the past 5 years.
- 1.4 WORKMANSHIP AND MATERIALS. Contractor shall guarantee all equipment against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, and leakage, breakage, or other failure. Materials shall be suitable for service conditions.

All equipment shall be designed, fabricated, and assembled in accordance with recognized and acceptable engineering and shop practice. Individual parts shall be manufactured to standard sizes and thicknesses so that repair parts, furnished at any time, can be installed in the field. Like parts of duplicate units shall be interchangeable. Equipment shall not have been in service at any time prior to delivery, except as required by tests.

Except where otherwise specified, structural and miscellaneous fabricated steel used in equipment shall conform to AISC standards. All structural members shall be designed for shock or vibratory loads. Unless otherwise specified, all steel which will be submerged, all or in part, during normal operation of the equipment shall be at least 1/4 inch thick. When dissimilar metal components are used, consideration shall be given to prevention of galvanic corrosion.

- 1.5 LUBRICATION. Equipment shall be adequately lubricated by systems that require attention no more frequently than weekly during continuous operation. Lubrication systems shall not require attention during startup or shutdown and shall not waste lubricants.

Lubricants of the types recommended by the equipment manufacturer shall be provided in sufficient quantities to fill all lubricant reservoirs and to replace all consumption during testing, startup, and operation prior to acceptance of equipment by Owner. Lubricants for equipment where the lubricants may come in contact with water before or during a potable water treatment process or with potable water, shall be food grade lubricants. This includes lubricants for equipment not normally in contact with water, but where accidental leakage of the lubricants may contaminate the water.

Lubrication facilities shall be convenient and accessible. Oil drains and fill openings shall be easily accessible from the normal operating area or platform. Drains shall allow for convenient

collection of waste oil in containers from the normal operating area or platform without removing the unit from its normal installed position.

- 1.6 ELEVATION. The elevation of the site shall be as indicated in the respective equipment specification sections. All equipment furnished shall be designed to meet stipulated conditions and to operate satisfactorily at the specified elevation.
- 1.7 ELECTRIC MOTORS. Unless otherwise specified, motors furnished with equipment shall meet the requirements specified in Section 16220, General Purpose Induction Motors, or specified in specific equipment sections.
- 1.8 DRIVE UNITS. The nominal input horsepower rating of each gear or speed reducer shall be at least equal to the nameplate horsepower of the drive motor. Drive units shall be designed for 24-hour continuous service.
 - A. Gearmotors. The use of gearmotors sharing an integral housing or cutgears into the motor output shaft, or that require removal of lubricant from the gear reducer to change out the motor will not be acceptable.
 - B. Gear Reducers. Each gear reducer shall be a totally enclosed unit with oil or grease lubricated, rolling element, antifriction bearings throughout.

Unless superseded by individual specification requirements each helical, spiral bevel, combination bevel-helical, and worm gear reducers shall have a service factor of at least 1.50 based on the nameplate horsepower of the drive motor. Cycloidal gear reducers shall have a service factor of at least 2.0 based on the nameplate horsepower of the drive motor. Shaft-mounted and flange-mounted gear reducers shall be rated AGMA Class III. Helical gear reducers shall have a gear strength rating to catalog rating of 1.5. Each gear reducer shall be designed and manufactured in compliance with applicable most current AGMA standards, except the L10 bearing life shall be 200,000 hours.

The thermal horsepower rating of each unit shall equal or exceed the nameplate horsepower of the drive motor. During continuous operation, the maximum sump oil temperature shall not rise more than 100°F above the ambient air temperature near the unit and shall not exceed 200°F.

Each grease lubricated bearing shall be installed in a bearing housing designed to facilitate periodic re-greasing of the bearing by means of a manually operated grease gun. Each bearing housing shall be designed to evenly distribute new grease, to properly dispose of old grease, and to prevent over greasing of the bearing. The use of permanently sealed, grease-lubricated bearings will not be acceptable in large sized reducers. In small reducers, similar to basin equipment, permanently sealed grease lubricated bearings rated L10 200,000 hour life may be provided at the manufacturer's option. An internal or external oil pump and appurtenances shall be provided if required to properly lubricate oil-lubricated bearings. A dipstick or a sight glass arranged to permit visual inspection of lubricant level shall be provided on each unit.

Gear reducers that require the removal of parts or the periodic disassembly of the unit for cleaning and manual re-greasing of bearings will not be acceptable.

- C. Adjustable Speed Drives. Each mechanical adjustable speed drive shall have a service factor of at least 1.75 at maximum speed based on the nameplate horsepower of the drive motor. A spare belt shall be provided with each adjustable speed drive unit employing a belt for speed change.

Unless specifically permitted by the detailed equipment specifications, bracket type mounting will not be acceptable for variable speed drives.

- D. V-Belt Drives. Each V-belt drive shall include a sliding base or other suitable tension adjustment. V-belt drives shall have a service factor of at least 1.75 at maximum speed based on the nameplate horsepower of the drive motor.

- 1.9 SAFETY GUARDS. All belt or chain drives, fan blades, couplings, and other moving or rotating parts shall be covered on all sides by a safety guard. Safety guards shall be fabricated from 16 USS gage thick or thicker galvanized, aluminum-clad sheet steel, or stainless sheet steel or from 1/2-inch mesh galvanized expanded metal, or poltrusion molded UV resistant materials. Each safety guard shall be reinforced or shaped to provide suitable strength to prevent vibration and deflection and shall comply with OSHA. Each guard shall be designed for easy installation and removal. All necessary supports and accessories shall be provided for each guard. Supports and accessories, including bolts, shall be galvanized. All safety guards in outdoor locations shall be designed to prevent the entrance of rain and dripping water.

- 1.10 ANCHOR BOLTS. Equipment suppliers shall specify anchor bolt size and quantity for each item of equipment. Anchor bolts, together with templates or setting drawings, shall be delivered sufficiently early to permit setting the anchor bolts when the structural concrete is placed. Anchor bolts shall comply with the Specification Section 05500 - Anchorage in Concrete and Masonry and, unless otherwise specified, shall be at least 3/4 inch in diameter.

Unless otherwise indicated or specified, anchor bolts for items of equipment mounted on base plates shall be long enough to permit 1-1/2 inches of grout beneath the baseplate and to provide adequate anchorage into structural concrete.

- 1.11 EQUIPMENT BASES. Unless otherwise indicated or specified, all equipment shall be installed on concrete bases at least 6 inches high. Cast iron or welded steel base plates shall be provided for pumps, compressors, and other equipment. Each unit and its drive assembly shall be supported on a single baseplate of neat design. Baseplates shall have pads for anchoring all components, and adequate grout holes. Baseplates for pumps shall have a means for collecting leakage and a threaded drain connection. Baseplates shall be anchored to the concrete base with suitable anchor bolts and the space beneath filled with grout as specified in Section 03600 - Grout.

- 1.12 SPECIAL TOOLS AND ACCESSORIES. Equipment requiring periodic repair and adjustment shall be furnished complete with all special tools, instruments, and accessories required for proper maintenance. Equipment requiring special devices for lifting or handling shall be furnished complete with those devices.

- 1.13 SHOP PAINTING. All iron and steel surfaces of the equipment shall be protected with suitable protective coatings applied in the shop. Surfaces of the equipment that will be inaccessible after assembly shall be protected for the life of the equipment. Coatings shall be suitable for the environment where the equipment is installed. Exposed surfaces shall be finished, thoroughly cleaned, and filled as necessary to provide a smooth, uniform base for painting. Electric motors, speed reducers, starters, and other self-contained or enclosed components shall be shop primed or finished with an epoxy or polyurethane enamel or universal type primer suitable for top coating in the field with a universal primer and aliphatic polyurethane system.

Surfaces to be coated after installation shall be prepared for painting as recommended by the paint manufacturer for the intended service, and then shop painted with one or more coats of a

universal primer.

Machined, polished, and nonferrous surfaces that are not to be painted shall be coated with rust-preventive compound as recommended by the equipment manufacturer.

- 1.14 ELECTRICAL. All electrical work shall comply with the following codes:

National Electrical Code (NEC)

National Electrical Safety Code (NESC)

- 1.15 INSTALLATION AND OPERATION. Installation and operation shall be as specified in respective equipment sections and Specification Sections 01650.

- 1.16 OBSERVATION OF PERFORMANCE TESTS. Where the Specifications require the presence of Owner's Representative, initial tests shall be observed or witnessed by Owner's Representative. Owner's Representative shall be reimbursed by Contractor for all costs of subsequent visits by Owner's Representative to witness or observe incomplete tests, retesting, or subsequent tests.

- 1.16 PROGRAMMING SOFTWARE. Programming software shall be provided for any equipment that includes a programmable logic controller (PLC) or other digital controller that is user programmable. The software shall be suitable for loading and running on a laptop personal computer operating with a Windows-based operating system. A copy of the manufacturer's original operating logic program shall be provided for use in maintaining and troubleshooting the equipment. Where multiple pieces of equipment, from the same or different vendors, use the same programming software, only one copy of the software need be provided.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION 01610

SECTION 01612 – SHIPPING, HANDLING AND STORAGE

1. SCOPE. This Section covers packaging, shipping, delivery, storage, and handling of materials and equipment.
2. PREPARATION FOR SHIPMENT. All equipment shall be suitably packaged to facilitate handling and to protect against damage during transit and storage. All equipment shall be boxed, crated, or otherwise completely enclosed and protected during shipment, handling, and storage. All equipment shall be protected from exposure to the elements and shall be kept dry at all times.

Painted and coated surfaces shall be protected against impact, abrasion, discoloration, and other damage. Painted and coated surfaces which are damaged prior to acceptance of equipment shall be repainted to the satisfaction of Owner's Representative.

Grease and lubricating oil shall be applied to all bearings and similar items.

3. SHIPPING. Before shipping each item of equipment shall be tagged or marked as identified in the delivery schedule or on the Shop Drawings.

Complete packing lists and bills of material shall be included with each shipment.

2. DELIVERY. Contractor shall bear the responsibility for delivery of equipment, spare parts, special tools, and materials to the site and shall comply with the requirements specified herein and shall provide required information concerning the shipment and delivery of the materials specified in this Contract. These requirements also apply to any subsuppliers making direct shipments to the jobsite.

Contractor shall, either directly or through contractual arrangements with others, accept responsibility for the safe handling and protection of the equipment and materials furnished under this Contract before and after receipt at the port of entry. Acceptance of the equipment shall be made after it is installed, tested, placed in operation and found to comply with all the specified requirements.

All items shall be checked against packing lists immediately on delivery to the site for damage and for shortages. Damage and shortages shall be remedied with the minimum of delay.

Delivery of portions of the equipment in several individual shipments shall be subject to review of Owner's Representative before shipment. When permitted, all such partial shipments shall be plainly marked to identify, to permit easy accumulation, and to facilitate eventual installation.

3. STORAGE. Upon delivery, all equipment and materials shall immediately be stored and protected until installed in the Work.

Stacked items shall be suitably protected from damage by spacers or load distributing supports that are safely arranged. No metalwork (miscellaneous steel shapes and reinforcing steel) shall be stored directly on the ground. Masonry products shall be handled and stored in a manner to hold breakage, chipping, cracking, and spalling to a minimum. Cement, lime, and similar products shall be stored off the ground on pallets and shall be covered and kept completely dry at all times. Pipe, fittings, and valves may be stored out of doors, but must be placed on wooden blocking. PVC pipe, geomembranes, plastic liner, and other plastic materials shall be stored off the ground on pallets and protected from direct sunlight.

Pumps, motors, electrical equipment, and all equipment with antifriction or sleeve bearings shall be stored in weather tight structures maintained at a temperature above 60°F. Electrical equipment controls, and insulation shall be protected against moisture and water damage. All space heaters furnished in equipment shall be connected and operated continuously.

Equipment having moving parts, such as gears, bearings, and seals, shall be stored fully lubricated with oil, grease, etc., unless otherwise instructed by the manufacturer. Manufacturer's storage instructions shall be carefully followed by Contractor.

When required by the equipment manufacturer, moving parts shall be rotated a minimum of twice a month to ensure proper lubrication and to avoid metal to metal "welding". Upon installation of the equipment, Contractor shall, at the discretion of Owner's Representative, start the equipment at one-half load for an adequate period of time to ensure that the equipment does not deteriorate from lack of use.

When required by the equipment manufacturer, lubricants shall be changed upon completion of installation and as frequently as required thereafter during the period between installation and acceptance. New lubricants shall be put into the equipment by Contractor at the time of acceptance.

Equipment and materials shall not show any pitting, rust, decay, or other deleterious effects of storage when installed in the Work.

In addition to the protection specified for prolonged storage, the packaging of spare units and spare parts shall be for export packing and shall be suitable for long-term storage in a damp location. Each spare item shall be packed separately and shall be completely identified on the outside of the container.

4. HANDLING. Stored items shall be laid out to facilitate their retrieval for use in the Work. Care shall be taken when removing the equipment for use to ensure the precise piece of equipment is removed and that it is handled in a manner that does not damage the equipment.

END OF SECTION 01612

SECTION 01630 – PIPING SCHEDULE

1. SCOPE. This Section consists of a schedule pipelines indicating the type of pipe to be used. Pipe materials, installation, testing, and disinfection, when specified, are covered in other Specification Sections.

Piping to be furnished with equipment is covered in the applicable equipment Specification Section.

2. ALTERNATIVE PIPE TYPES. Where more than one type of pipe is indicated in the schedule, the type of pipe material to be installed may be selected by Contractor. The details on the Drawings cover only one type of pipe for each line. If a different material is selected by Contractor, all details of connections, jointing, wall fittings, support, anchorage, and harnesses shall be modified as necessary to produce an equivalent design acceptable to the Engineer.
3. WALL FITTINGS. A wall pipe or sleeve will be required for all pipe passing through concrete or masonry block walls. Wall fittings and sleeves shall be as indicated on the Drawings and as specified in the applicable piping Specification Section.
5. SCHEDULE. Pipe materials shall conform to Schedule 01630-S01. All pipelines indicated on the Drawings and all pipelines required for proper operation of the equipment furnished shall be provided whether listed in the schedule or not.

Schedule 01630 – S01
 Piping Schedule

Service	Location	Abbreviation	Sizes (inch)	Material Type / Specification Section	Joints	Valves Type / Specification Section	Coating Type / Specification Section	Insulation Type / Specification Section	Test Type / Section
Force Main	Above Grade, Vaults and Manholes	FM	4 and Larger	DIP1 / 15061	Flanged	VC / 15093 VG / 15104 VB2 / 15091	A2 / 09940	PMF1 / 15250	A / 15020
Potable Cold Water	Above Grade	CW	3 and Smaller	CU3 / 15070	Solder and Brazed	VB2 / 15091	None	PFC1 / 15250	A / 15020
Potable Cold Water	Buried	CW	2 and Smaller	CU1 / 15070	Flared	None	None	None	A / 15020
Potable Hot Water	Above Grade	HW	3 and Smaller	CU3 / 15070	Solder and Brazed	VB2 / 15091	None	PMF1 / 15250	A / 15020
Sanitary Drain	Above Grade	SAN	All	CI2 / 15069	Hubless	None	A2 / 09940	None	D / 15020
Sanitary Drain	Below Slab	SAN	All	CI1 / 15069	Bell and Spigot	None	None	None	D / 15020
Sanitary Sewer	Buried	SAN	All	SDR35/ 02628	Bell and Spigot	None	None	None	02628
Sanitary Drain Vent	Above Grade	V	All	CI2 / 15069	Hubless	None	A2 / 09940	None	D / 15020

END OF SECTION 01630

SECTION 01650 - STARTUP REQUIREMENTS

1.1 SCOPE. This Section covers startup requirements for all items of equipment and systems including mechanical equipment. Additional requirements may be specified in specific equipment specifications. The requirements of this Section shall be satisfactorily completed prior to any field tests specified in the specific equipment Sections.

2.1 GENERAL. Equipment shall not be operated except by, or with the guidance of, qualified personnel having the knowledge and experience necessary to obtain proper results. All items of equipment and systems shall be tested for proper operation, efficiency, and capacity. All required adjustments, tests, operation checks, and other startup activity shall be provided by qualified personnel. Contractor shall be responsible for planning, supervising, and executing the installation of Work.

A. Coordination. Contractor shall coordinate all tests related to startup of equipment and systems and shall report the results to Engineer in accordance with the Submittals Section. Contractor shall accept the equipment and the test results related to starting of equipment and systems before the Owner's Representative will accept the equipment and the test results.

When equipment is ready for a witness test, Contractor shall give written notice to the Owner's Representative at least 14 days before any offsite witness testing is performed or any field witnessed performance testing, unless otherwise specified.

3.1 EQUIPMENT TESTS.

A. Factory Tests. When specified in the specific equipment Sections, the equipment will be test run at the point of manufacture at the expense of the Supplier and the test results will be delivered to Engineer. Such equipment will not be shipped until the Owner's Representative has reviewed the test results and advised the Contractor, in writing, that the equipment is acceptable for shipment. Such acceptance, however, will not be considered as final acceptance, which will only be made on the basis of the test results of the equipment after installation.

B. Preliminary Field Tests. All items of mechanical equipment shall be given a preliminary field test by Contractor after installation for proper operation, efficiency, and capacity. The preliminary field test shall consist of the requirements listed herein, unless exceptions or additions are indicated in the specific equipment Sections.

Contractor's test operation of each piece of mechanical equipment shall continue for not less than 8 hours without interruption. All moving parts of equipment and machinery shall be carefully tested for operation, and adjusted so all parts move freely and function to secure satisfactory operation. All equipment shall be tested continuously under actual or simulated operating conditions. All parts shall operate satisfactorily in all respects, under continuous full load and in accordance with the specified requirements, for the full duration of the 8 hour test period. If any part of a unit shows evidence of unsatisfactory or improper operation during the 8 hour test period, correction or repairs shall be made and the full 8 hour test operation, as specified, shall be completed after all parts operate satisfactorily.

Tests of all process and pumping equipment, drive motors, including auxiliaries shall be made in accordance with the appropriate and approved test codes such as the American Society of Mechanical Engineers, Hydraulic Institute Standards, and IEEE.

Tests shall be conducted after the Work is substantially complete so each item of equipment is ready for integrated operation with other equipment at the plant. Testing, measuring, and calibrating procedures shall be submitted to Engineer for review and acceptance prior to startup and testing of equipment.

The equipment shall be properly filled, by Contractor, with oil and grease, and Contractor shall furnish all power, personnel, water, chemicals, fuels, oil, grease, and auxiliaries necessary for conducting the testing of the equipment for proper operation, efficiency, and capacity.

The period of inspection, initial startup operation, and field adjustment shall be as needed to achieve satisfactory installation and operation of the items furnished. Any period required for instruction of Owner's personnel shall be as specified in the Contract Documents.

When the specific equipment Sections indicate that an installation check is required by the equipment manufacturer, the manufacturer's representative will make all necessary field adjustments and correct defects in materials or workmanship during this test period.

All equipment installed under this Contract, including that furnished by others, shall be placed into successful operation according to the written instructions of the equipment manufacturer and the instructions of the manufacturer's field representative.

- C. Field System Operation Test. After all equipment is installed and the entire plant or system is ready to operate, Contractor shall conduct a field system operation test. The test shall consist of the requirements listed herein, unless exceptions or additions are indicated in the specific equipment Sections.

The test period shall be at least 7 days, and each system shall operate under actual or simulated operating conditions before a certificate of Substantial Completion of the Work is issued. All defects of material, workmanship, or equipment which appear during this test period shall be corrected by Contractor. After such corrections are made, the 7 day test shall be repeated before a certificate of Substantial Completion of Work is issued, unless waived by Owner's Representative.

Contractor shall supply all power, water, oil, grease, auxiliaries, and operating personnel required for this operation test.

When necessary for certain items of equipment, the final adjustments and inspections will be made by factory trained service personnel (other than sales representatives), representing the Supplier, rather than by Contractor. The service personnel will also supervise the test operation. This requirement will be stated under the detailed specification for the particular piece or pieces of equipment. The manufacturer's service personnel will make adjustments and supervise testing by Contractor until such tests have been accepted by the Owner's Representative.

- 4.1 ACCEPTANCE. When no other field tests for acceptance are specified in the equipment Sections, at the end of the field system operation testing, each system will be accepted if, in the opinion of the Owner's Representative, it has operated satisfactorily without excessive power use, wear, or need for lubrication, or requiring undue attention; and if all its rotating parts operate

without excessive vibration or noise at any operating condition.

When other field tests for acceptance are specified in the equipment Sections, acceptance shall be after all tests are satisfactorily conducted as specified in the appropriate equipment procurement specification.

When a field performance test for baseline is specified in the equipment Sections, acceptance shall be after a completion of the baseline performance test that is conducted as specified in the pumping unit field testing - baseline performance Section.

Acceptance by Owner or approval of the manufacturer's field representative will not relieve Contractor of responsibility for defective Work.

END OF SECTION 01650

SECTION 01781 - OPERATIONS AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide operation and maintenance data, as described in this Section, for use as instructional and reference manuals by operations and maintenance personnel at the Site. Listing of operation and maintenance data required is in Table 01781-A at the end of this Section. At minimum, provide operation and maintenance data for:
 - 1. All equipment and systems.
 - 2. Valves, gates, actuators, and related accessories.
 - 3. Instrumentation and control devices. Additional requirements are indicated in Division 13 specifications.
 - 4. Electrical gear.
- B. Required Operation and Maintenance Data: For each operation and maintenance manual required, provide the following:
 - 1. Preliminary Submittal: Printed and bound copy of entire operation and maintenance manual, except for test data, service reports by Supplier's representative, and electronic copies.
 - 2. Final Submittal: Printed and bound copy of complete operations and maintenance manual, including test data and service reports by Supplier's representative, with electronic copies.
- C. Prepare each operations and maintenance manual specifically for 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 printed materials required to provide accurate and comprehensive information for safe and proper operation, maintenance, and repair of products furnished for Project. Include in manual all specific information required by applicable Specification Section, and all data required by Laws and Regulations and by authorities having jurisdiction.

1.2 NUMBER OF COPIES AND TIMING OF SUBMITTALS

- A. Number of Copies Required and Timing of Submittals:
 - 1. Preliminary Submittal:

Three hard copies and one electronic copy, exclusive of copies required by CONTRACTOR.

Provide submittal to OWNER'S REPRESENTATIVE by the earlier of: ninety days following approval of Shop Drawings and related submittals, or ten days prior to starting operations and maintenance personnel training and operational testing at the Site.

Preliminary submittal shall be provided in acceptable form and content and be reviewed by OWNER'S REPRESENTATIVE before payment will be made for the associated products.

2. Final Submittal: Provide final submittal prior to Substantial Completion, unless submittal is specified as required prior to an interim Milestone.

Printed Copies: 5 copies.

Electronic Copies: 2 copies.

1.3 FORMAT OF HARDCOPIES

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 minimum one-inch wide and maximum of three-inch 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 manual.
5. Provide the following information on cover of each volume:

Title, "OPERATING AND MAINTENANCE INSTRUCTIONS".

Name or type of equipment covered in the manual.

Volume number, if more than one volume is required.

Name of Project and, if applicable, contract name and number.

Name of building or structure, as applicable.
6. Provide the following information on spine of each volume:

Title, "OPERATING AND MAINTENANCE INSTRUCTIONS".

Name or type of equipment covered in the manual.

Volume number, if more than one volume is required.

Project name and building or structure name.

B. Pages:

1. Print pages in manual on 8.5 inches by 11 inches paper.
2. Provide each page with binding margin of at least one inch wide. Punch each page with holes suitable for the associated binding.

C. Drawings:

1. Bind into the manual drawings, diagrams, and illustrations up to and including 11 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. Provide no more than three drawings per pocket.

D. Copy Quality and Document Clarity:

1. All contents shall be original-quality copies, viz., material shall either be original manufacturer-printed materials or first-generation photocopies indistinguishable from originals. Manuals that contain copies that are not clear, not completely legible, off-center, skewed, or where text or drawings are cut by binding holes, will be rejected. 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 all components of equipment on catalog pages for ease of identification. In standard or pre-printed documents, indicate options provided or cross out inapplicable material. Use of highlighters is unacceptable.

E. Organization:

1. Coordinate with OWNER'S REPRESENTATIVE and OWNER to develop comprehensive, practical, and consistent indexing system for operations and maintenance data. OWNER'S REPRESENTATIVE and OWNER will review indexing system before operations and maintenance data is submitted.

2. Table of Contents:

Provide table of contents in each volume of each operations and maintenance manual.

In table of contents and at least once in each chapter or section, identify products by their functional names. Thereafter, abbreviations and acronyms may be used if their meaning is explained in table bound at or near end of each volume. Using product model or catalog designations for identification is not acceptable.

3. 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 Manuals:

1. Electronic copy shall include all information provided in hardcopy.
2. Provide each electronic copy on a separate compact disc (CD).
3. File Format:

Files shall be in Adobe Acrobat portable document format (PDF). Files shall be electronically searchable.

Provide separate file for each separate document in the hardcopy.

Within each file, provide bookmarks for the following: Each chapter and subsection listed in the hardcopy document's table of contents; Each figure; Each table; and Each appendix.

4. Also provide drawings and figures in one of the following formats: “.bmp”, “.tif”, “.jpg”, or “.gif”. Provide files in separate directory on CD.

B. Copies of Programming and Configuration Files:

1. Provide on CD copy of all software programming, such as programmable logic controller programs, prepared specifically for the Project. Third-party, commercially available software is excluded from requirements of this article; provide copies of commercially-available, third-party software as specified in the Contract Documents.
2. Provide on CD copies of system configuration prepared specifically for the Project, such as SCADA display configurations.
3. Provide number of programming and configuration files as specified for electronic copies of operation and maintenance data.

1.5 CONTENT

- A. Provide complete, detailed written operating instructions for each product 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 product and proper responses to such alarm conditions.
- B. Provide written explanations of all safety considerations relating to operation and maintenance procedures.
- C. Provide complete, detailed, written preventive maintenance instructions including all information and instructions to keep product or system properly lubricated, adjusted, and maintained so that products function economically throughout design life. Instructions shall include:

1. Written explanations with illustrations for each preventive maintenance task such as inspection, adjustment, lubrication, calibration, and cleaning. Provide pre-startup check-lists 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. Complete bills of material or parts lists for products provided. Lists or bills of material may be provided 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, phone number, fax number, and Internet and e-mail addresses, if applicable.
 3. Manufacturer's shop order and/or serial number(s) for product or assembly furnished.
 4. For each part or piece provide:

Parts cross-reference number. Cross-reference number shall be used to identify the part on assembly drawing, Shop Drawing, or other type of illustration where the part is clearly shown.

Part name or description.

Manufacturer's part number.

Quantity of each part used in each assembly.

Current unit price of the part at the time the operations and maintenance manual is submitted. Price list shall be dated.
- E. Compete instructions for ordering of all replaceable parts, including reference numbers (e.g., shop order or serial number) that will expedite ordering process.
- F. Manufacturer's recommended inventory levels for spare parts and consumable supplies for the first two years of operation. Consumable supplies are those items consumed or worn by operation of equipment, and items used in maintaining the operation of product, including items such as lubricants, seals, reagents, and testing chemicals used for calibrating or operating the equipment. Provide estimated delivery times, shelf life limitations, and special storage requirements.

- G. Provide manufacturer's installation and operation bulletins, diagrams, schematics, and equipment cutaways. Avoid providing catalog excerpts unless they are the only material 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 product supplied. Marking may be in the form of checking, arrows, or underlining to show pertinent information, or by crossing out or other means of obliterating information that does not apply to the products furnished.
 - H. Provide original-quality copies of each approved and accepted Shop Drawing and submittal, updated to as-installed condition. Reduced drawings are permissible 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. Provide complete electrical schematic and wiring diagrams, including complete point-to-point wiring and wiring numbers or colors between all terminal points.
 - J. Programmable Logic Controllers:
 - 1. Provide complete ladder diagram logic.
 - 2. For ladder diagram logic, include complete cross-referencing of all logic elements. Annotate all elements with clearly understandable tags or descriptive labels.
 - 3. For function block diagram, label each function block with understandable tags or descriptive labels. Describe purpose and action of each function block.
 - 4. For sequential function chart, include extensive comments for each step to describe program step function.
 - 5. For instruction list and structured text, include extensive comments for each program line to describe program line function.
 - 6. Provide complete programmable logic controller listing of all input/output address assignments, tag assignments, and pre-set constant values, with functional point descriptions.
 - 7. Provide complete manufacturer's programming manuals.
 - K. Copy of warranty bond and service contract as applicable.
 - L. When copyrighted material is used in operations and maintenance manual, obtain copyright holder's written permission to use such material in the operation and maintenance manual.
- 1.6 SUBMITTALS REQUIRED
- A. Provide operation and maintenance data for the following:

TABLE 01781-A
REQUIRED OPERATIONS AND MAINTENANCE DATA

Specification Section	Type of Equipment
11140	Process Submersible Pumps
13500	Instrumentation and Control System
14223	Free Standing Jib Cranes
15180	Electric Valve Actuators
15500	Mini-Split System
16721	Fire Alarm and Detection System
16725	Electronic Security System

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION 01781

SECTION 01800 - PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 DESCRIPTION OF PROJECT CLOSEOUT

- A. Closeout is hereby defined to include general requirements near the end of the Contract Time, in preparation for final acceptance, final payment, normal termination of contract, occupancy by OWNER and similar actions evidencing completion of the work. Specific requirements for individual units of work are specified in Sections of Divisions 2 through 16.

1.2 FINAL CLEANUP

- A. Prior to Final Completion of work and immediately prior to final inspection, cleaning of the entire project will be accomplished according to the following provisions:
 - 1. The CONTRACTOR shall thoroughly clean, sweep, wash, and polish all work and equipment, including finishes. The cleaning shall leave the structures and site in a complete and finished condition to the satisfaction of the Engineer.
 - 2. Should the CONTRACTOR not remove rubbish or debris or not clean structures and site as specified above, the OWNER's reserves the right to have the cleaning done at the expense of the CONTRACTOR.
 - 3. Employ professional cleaners for final cleaning.
 - 4. In preparation for Substantial completion of occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.
 - 5. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from sight-exposed interior and exterior finished surfaces; polish surfaces so designated to shine finish.
 - 6. Repair, patch, and touch up marred surfaces to specified finish, to match adjacent surfaces.
 - 7. Broom clean paved surfaces; rake clean other surfaces of grounds.
 - 8. Remove from the OWNER's property all temporary structures and all materials, equipment, and appurtenances not required as a part of or appurtenant to, the completed work.

1.3 RECORD DRAWINGS

- A. The CONTRACTOR shall prepare and submit contract Record Drawings to the OWNER.
 - 1. The CONTRACTOR shall keep an up-to-date set of marked-up Contract Drawings on a OWNER-supplied set of Drawings. The OWNER-supplied set of Drawings will consist of one set of full-size reproductions of the Contract Drawings, supplied to the

CONTRACTOR at the start of the work.

2. During the progress of the work, the CONTRACTOR shall record on the Contract Record Drawings any changes from or additions to the work described in the Plans and Specifications. All information recorded on the Contract Record Drawings shall be clearly legible and should follow the color code for marking drawings.

Red pencil/pen shall be used to indicate additions and/or modifications to the drawings.

Green pencil shall be used to indicate deletions to the drawings.

Yellow pencil/highlighter shall be used to indicate portions of drawing that have been field verified to confirm portions installed as designed and to show construction progress.

All marks on drawings shall be dark and legible. Text shall be legibly printed in block style letters. Information to be recorded on the Contract Record Drawings shall include, but not be limited to, the following:

Actual routing of electrical conduits, whose routing is only indicated in general on the Drawings.

For all electrical duck bank the conduit size and number of conduits shall be noted adjacent to the duck bank routings.

Actual location of manhole structures.

Actual alignment of all installed pipe.

Specific details of pipe connections, and manhole structures.

Specific details on the installation and connection of mechanical and electrical equipment.

Field dimensions where they differ from those shown on the Drawings.

Additions to and/or deletions from the work, including all contract change orders.

Other details showing as-built conditions, which are shown differently or only in general on the Drawings.

Addenda.

Location of buried features located during construction except utility service connections.

3. It is the CONTRACTOR's responsibility to ensure that any changes, deletions, specific construction details, etc., performed by a subcontractor are recorded on the Contract Record Drawings.
4. The CONTRACTOR shall have a New York State Registered Land Surveyor survey the lateral and vertical position of anything buried underground as part of this Contract to within one inch accuracy of the benchmark and baseline provided by the OWNER. The survey information shall be included on the record drawings and the CONTRACTOR shall

not be allowed to cover the buried materials until after the OWNER's inspector has verified the information as accurate and complete, and is shown on the record drawings.

5. Once every month, starting from the Notice to Proceed, the CONTRACTOR shall provide the OWNER with a copy of the then up-to-date set of marked-up Contract Record Drawings.
6. Prior to Project Closeout, the CONTRACTOR shall provide the OWNER with the Contract Record Drawings, showing all "as-built" conditions.

1.4 GUARANTEES

- A. The "General Conditions" cover the CONTRACTOR's responsibility to remedy defects due to faulty workmanship and materials which appear within one year from the date of final acceptance.
- B. Special guarantees are required by various Sections of the Specifications. Assemble written guarantees, label and submit to the Engineer.
 1. Equipment guarantees shall be written in the manufacturer's standard form and shall be countersigned by the subcontractor or supplier and the CONTRACTOR.
 2. All other guarantees shall be written on the subcontractor's or supplier's letterhead and shall be countersigned by the CONTRACTOR.

1.5 SPARE PARTS AND MAINTENANCE MATERIALS

- A. Spare parts and maintenance materials are required by various Sections of the Specifications.
 1. Parts and materials shall be packaged so as to preclude damage in normal handling and storage.
 2. Packages shall be labeled with full description of contents and project name and clearly identified as to which item of equipment they belong to. CONTRACTOR shall maintain a spare parts inventory list which shall be provided to the OWNER prior to final acceptance.
 3. Submit packaged parts and materials to the OWNER.

1.6 FINAL INSPECTION AND ACCEPTANCE

- A. Prior to requesting Engineer's final inspection for certification of final acceptance and final payment, complete the following and list known exceptions (if any):
 1. Submit copy of final punch list of itemized work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, endorsed and dated by Engineer.
 2. Submit Consent of Surety.
 3. Revise and submit evidence of final, continuing insurance coverage complying with insurance requirements.

4. Submit specific warranties, maintenance agreements and final certifications.
 5. Deliver all tools, spare parts, and extra stock of materials.
 6. Change over all locks to OWNER cores/key.
- B. Certify in writing that the work has been completed in accordance with the Contract Documents, and request Engineer's final inspection.
- C. Within seven (7) days after receipt of the CONTRACTOR's notice that the work has been completed, including punch list items resulting from earlier inspections, and excepting incomplete items delayed because of acceptable circumstance, the Engineer will re-inspect the work. Upon completion of re-inspection, Engineer will either prepare a certificate of final acceptance or advise the CONTRACTOR of work not complete or obligations not fulfilled as required for final acceptance. If necessary, inspection procedure will be repeated.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION 01800

SECTION 01821 - INSTRUCTION OF OPERATIONS AND MAINTENANCE PERSONNEL

PART 1 - GENERAL

1.1 DESCRIPTION

- A. CONTRACTOR shall provide services of Supplier's operation and maintenance training specialists to instruct Owner's personnel in recommended operation and maintenance procedures for products and equipment per the Specifications.
- B. Supplier shall provide a combination of classroom and field training. All training shall be conducted at the Site, unless otherwise stated in the Specifications.
- C. OWNER reserves the right to videotape training sessions.
- D. Scheduling of Training Sessions:

- 1. General:

CONTRACTOR shall coordinate training services with start-up and initial operation of products and equipment on days and times, and in manner, acceptable to OWNER and per the Specifications.

Training may be required outside of normal business hours to accommodate schedules of operations and maintenance personnel. Provide services as necessary at no additional cost to OWNER.

- 2. Prerequisites to Training:

Training of OWNER'S personnel shall commence only after acceptable preliminary operation and maintenance data have been provided and Work described in Section 01650 – Startup Requirements has been completed.

At option of OWNER or OWNER'S REPRESENTATIVE, training may be allowed to take place before, during, or after equipment start-up.

- 3. Training Schedule Submittal:

Training Schedule Required: CONTRACTOR shall prepare and submit proposed training schedule for review and acceptance by OWNER'S REPRESENTATIVE and OWNER. Proposed training schedule shall show all training required under the Contract, and shall demonstrate compliance with specified training requirements relative to number of hours of training, number of training sessions, and scheduling.

Timing of Submittal: Submit initial training schedule at least sixty days prior to scheduled start of first training session. Submit final training schedule, incorporating revisions per comments of OWNER and OWNER'S REPRESENTATIVE, no later than thirty days prior to start of first training session. OWNER'S REPRESENTATIVE

may reduce the number of days and otherwise modify requirements for submittal of training schedule.

OWNER reserved the right to modify training schedule to meet process or emergency needs at the Site.

1.2 QUALITY ASSURANCE

A. Qualifications:

1. Supplier's instructors shall be factory-trained by manufacturer of equipment or product.
2. Supplier's instructors shall be proficient and experienced in conducting training of type required.
3. Qualifications of instructors are subject to acceptance by OWNER'S REPRESENTATIVE. If OWNER'S REPRESENTATIVE does not accept qualifications of proposed instructor, provide 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 Site, to review:

Training requirements per the Contract Documents.

Work to be completed prior to starting training.

Work progress and Progress Schedule relative to start-up and training.

Scheduling constraints for Owner's personnel (i.e., days and times of training sessions).

Preferred days for training.

Training location and facilities available.

Required submittals.

Other issues relative to training of operations and maintenance personnel.

2. Attendance is mandatory for the following:

Contractor's project manager.

Contractor's Site superintendent.

Project manager of Subcontractors responsible for providing equipment and products for which training of Owner's personnel is required.

Suppliers invited by CONTRACTOR.

OWNER'S REPRESENTATIVE.

Owner'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 record discussions of conference and decisions and agreements (or disagreements) and provide copy of record 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 specified schedule requirements. Provide training schedule submittals per time frames specified in this Specification Section.

B. Informational Submittals: Submit the following:

1. Lesson Plan: Acceptable proposed lesson plan for training on each product or equipment item, per Table 01821-A and Specifications. Lesson plan shall conform to requirements of this Specification Section. Include with lesson plan copy of handouts that will be used during training sessions. Provide lesson plan submittals per time frames specified in this Specification Section.
2. Qualifications: Credentials of Supplier's proposed operations and maintenance instructor(s). Credentials shall demonstrate compliance with requirements of this Specification Section and shall include brief resume and specific details of instructor's operation, maintenance, and training experience relative to the specific products for which instructor will provide training.
3. Minutes of training scheduling conference.

C. Closeout Submittals: Submit the following:

1. Trainee sign-in sheet for each training session. Provide to Owner's training coordinator.

1.4 LESSON PLAN

- A. Supplier's lesson plan shall describe specific instruction topics, system components for which training will be provided, and training procedures. Handouts to be used in training shall be attached to lesson plan when applicable. Describe in lesson plan "hands-on" demonstrations planned for training sessions.
- B. Provide acceptable lesson plan fourteen days prior to starting associated training.

- C. Lesson plan shall include estimated duration of each training segment.
- D. Lesson plan shall include the following:
 - 1. Equipment Overview (required for all types of operations and maintenance training):
 - Describe equipment's operating (process) function and performance objectives.
 - Describe equipment's fundamental operating principles and dynamics.
 - 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.
 - Identify all support equipment associated with operation of subject equipment (i.e., air intake filters, valve actuators, motors).
 - Identify and describe all safety precautions and potential hazards related to operation.
 - Identify and describe in detail safety and control interlocks.
 - 2. Operations Personnel Training:
 - Equipment Overview: As described above.
 - Operation:
 - Describe operating principles and practices.
 - Describe routine operating, start-up, and shutdown procedures.
 - Describe abnormal or emergency start-up, operating, and shutdown procedures that may apply.
 - Describe alarm conditions and responses to alarms.
 - Describe routine monitoring and recordkeeping procedures.
 - Describe recommended housekeeping procedures.
 - Troubleshooting: Describe how to determine if corrective maintenance or an operating parameter adjustment is required.
 - 3. Mechanical Maintenance Training:
 - Equipment Overview: As described above.
 - Equipment Preventive Maintenance:
 - Describe preventative maintenance inspection procedures required to:
 - Inspect equipment in operation.

Spot potential trouble symptoms and anticipate breakdowns.

Forecast maintenance requirements (predictive maintenance).

Define recommended preventative maintenance intervals for each component.

Provide lubricant and replacement part recommendations and limitations.

Describe appropriate cleaning practices and recommend intervals.

Identify and describe use of special tools required for maintenance of equipment.

Describe component removal/installation and disassembly/assembly procedures.

Perform “hands-on” demonstrations of preventive maintenance procedures.

Describe recommended measuring instruments and procedures, and provide instruction on interpreting alignment measurements, as appropriate.

Define recommended torquing, mounting, calibrating, and aligning procedures and settings, as appropriate.

Describe recommended procedures to check and test equipment following corrective maintenance.

Equipment Troubleshooting:

Define recommended systematic troubleshooting procedures.

Provide component-specific troubleshooting checklists.

Describe applicable equipment testing and diagnostic procedures to facilitate troubleshooting.

Describe common corrective maintenance procedures with “hands on” demonstrations.

4. Instrumentation/Controls Maintenance Training:

Equipment Overview: As described above.

OWNER’S REPRESENTATIVE may grant waiver(s) to allow all training for a given system to be at the Site.

1.5 TRAINING AIDS

A. Supplier’s instructor shall incorporate training aids as appropriate to assist in the instruction. Provide text and figure handouts. Other appropriate training aids include:

1. Audio-Visual aids, such as videos, PowerPoint presentations, overhead transparencies, posters, blueprints, diagrams, catalog sheets.

2. Equipment cutaways and samples, such spare parts and damaged equipment.
 3. Tools, such as repair tools, customized tools, measuring and calibrating instruments.
- B. Handouts:
1. Supplier's instructor shall utilize descriptive class handouts during training. Customized handouts developed especially for training at the Site are encouraged.
 2. Photocopied handouts shall be good quality and completely legible.
 3. Handouts should accompany the instruction with frequent reference made to handouts.
 4. Provide at least fifteen copies of handouts per training session.
- C. Audio-visual Equipment: Supplier shall provide audio-visual equipment required for training sessions. If it is available at the Site, OWNER may make available Owner's audio-visual equipment; however, do not count on OWNER providing audio-visual equipment. Audio-visual equipment that Supplier shall provide, as required, includes:
1. Laptop computer, presentation software, and PowerPoint projector.
 2. As required, extension cords and spare bulb for projector.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 TRAINING DELIVERY

- A. 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 OWNER'S REPRESENTATIVE, with lesson content appropriate for trainees. If OWNER or OWNER'S REPRESENTATIVE deems that training delivery does not conform to requirements of Specifications, training shall be postponed, rescheduled, and re-performed in acceptable manner at no additional cost to OWNER.
 2. Trainee Sign-in Sheets: In format acceptable to OWNER, provide sign-in sheet for trainees for each session. Sign-in sheets shall include the Project name, product or system for which training was provided, and type of training (e.g., operations, mechanical maintenance, instrumentation/controls maintenance, or other), and name of each trainee. Upon completion of training, provide copy of each sign-in sheet to Owner's training coordinator.

B. “Hands-On” Demonstrations:

1. Supplier’s instructor shall present “hands-on” demonstrations of operations and maintenance of equipment for each training session, per lesson plan accepted by OWNER’S REPRESENTATIVE.
2. CONTRACTOR and Supplier shall all provide tools necessary for demonstrations.

3.2 TRAINING SCHEDULE

- A. Supplier shall provide, at minimum, hours of training and number of sessions shown in Table 01821-A. Travel time and expenses are responsibility of Supplier and are excluded from required training time specified in Table 01821-A and in the Specifications.

B. Shifts and Training Sessions Required:

1. Owner’s 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:

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:

Two identical sessions during day shift, each session in a different week.

One session during evening shift.

One session during night shift.

Mechanical Maintenance: Provide two identical training sessions during day shift, each session in a separate week, for designated equipment. Maximum training per day is four hours; sessions longer than four hours will be spread over multiple, preferably consecutive, days.

Instrument/Controls Maintenance: Provide two identical training sessions during day shift, each session in a separate week, for designated equipment. Maximum training per day is four hours; sessions longer than four hours will be spread over multiple, preferably consecutive, days.

TRAINING SUMMARY TABLE
 TABLE 01821-A

Specification Section	Type of Equipment	Operations # Training Sessions Required	Operations Hours per Training Session	Maintenance # Training Sessions Required	Maintenance Hours per Training Session	Electrical and Instrument Maintenance # Training Sessions Required	Electrical and Instrument Maintenance Hours per Training Session	Total Hours
11140	Process Submersible Pumps	1	2	1	2	NA	NA	4
13500	Instrumentation and Control System	1	2	1	1	NA	NA	3
15180	Electric Valve Actuators	1	1	1	1	NA	NA	2
15500	Mini-Split System	1	1	1	1	NA	NA	2
16160	Adjustable Frequency Drives	1	2	1	2	NA	NA	4
16721	Fire Alarm and Detection System	1	2	NA	NA	NA	NA	2
16725	Electronic Security System	1	2	NA	NA	NA	NA	2

ITEM 627.0002 25**SITE CONSTRUCTION****1. DESCRIPTION:**

- 1.01 Furnish all labor, materials, equipment and services necessary to complete the work as indicated on the Contract Plans and the attached Specification Summary.
- 1.02 All work shall conform to the requirements specified in Part 1 – General, of the Sections listed.

2. MATERIALS:

- 2.01 The materials shall be as specified in Part 2 – Products, of the Sections listed.

3. CONSTRUCTION DETAILS:

- 3.01 The construction details shall be as specified on Part 3 – Execution, if the Sections listed.

4. METHOD OF MEASUREMENT:

- 4.01 This item shall be measured for payment on a lump sum basis for the work completed in accordance with the Contract Documents and as directed by the Engineer.

5. BASIS OF PAYMENT:

- 5.01 Payment for this item shall be made at the lump sum bid price bid. The lump sum price bid shall include cost of furnishing all labor, material, equipment and appliances necessary to complete the work as indicated on the Contract Plans and as specified herein in the Sections listed.
- 5.02 Detailed Estimate:
 - A. Before the first certificate of payment is issued for the work under this item, submit a detailed estimate of quantities and prices for all materials, labor, and other items included under this item, which shall aggregate the contract lump sum price bid for this item. Prepare the detailed estimate in the same sequence as the Sections listed.
 - B. The detailed estimate shall be supported by such evidence, including certified copies of subcontracts, as the Engineer may require.
 - C. The detailed estimate must be approved by the Engineer who may revise it as, in his/her reasonable judgment, is necessary to make the various item conform to their true values. The value of each certificate of payment will be based on the approved detailed estimate.
- 5.03 Monthly payments will be made for this item in proportion to the total amount of work completed.

ITEM 627.0002 25**SITE CONSTRUCTION****1. SPECIFICATION SUMMARY**

1.01 This Item includes the following specifications:

- A. Section 02050 Demolition and Salvage
- B. Section 02240 Dewatering
- C. Section 02300 Earthwork
- D. Section 02456 Steel Sheet Piles
- E. Section 02516 Asphalt Paving
- F. Section 02575 Restoration of Surfaces
- G. Section 02628 PVC Gravity Sewer Pipe
- H. Section 02650 Precast Concrete Yard Structures
- I. Section 02704 Pipeline Pressure and Leakage Testing
- J. Section 02925 Topsoil and Groundcover
- K. Section 02960 Temporary Bypass Pumping Systems

1.02 This item shall include, but not be limited to, the following:

- A. Preparatory work on site.

1.03 Items specifically not paid for under this item shall include, but not be limited to, the following:

- A. Not Used

SECTION 02050 - DEMOLITION AND SALVAGE

PART 1 - GENERAL

- 1.1 SCOPE. This Section includes demolitions, salvage, removal and disposal work as shown on Drawings and schedules.
- 1.2 GENERAL. All structures and facilities of the existing facility that are not to be removed under this Contract must remain in continuous operation during the work.

Demolition and salvage work shall create minimum interference with Owner's operations and minimum inconvenience to Owner.

Furnish all labor, material, equipment and incidentals required for the following:

Demolition and removal of the existing facilities including but not limited to structural concrete, foundations, precast concrete, walkways, slabs, walls, doors, windows, structural and reinforcing steel, metals, roofing, masonry, architectural items, piping, electrical and mechanical equipment, tanks, paving, curbs, walks, fencing, and other existing facilities. Also included is the salvaging of designated materials.

The repair of any surfaces damaged or exposed by demolition is also included.

Also included in the demolition work is the installation of temporary bulkheads in the operating floor passageways to connect buildings or adjacent areas.

Contractor shall review the demolition requirements described in other Sections of the Specifications and shown on the Drawings and coordinate with the requirements in this Section. Unless more direction is given by a particular Specification or Drawing detail, the requirements of this Section shall govern. It is the intent of this Section that the structural renovation of the existing buildings and the installation of the new equipment shall be completely coordinated by Contractor, and that the resulting appearance of the facility be free of obvious holes, scars, chipped or damaged surfaces and be architecturally finished to match existing surfaces.

Blasting will not be permitted.

- 1.3 SUBMITTALS.
 - A. Methods. Submit, for review, proposed methods.
 - B. Schedule. Submit an "Outage Request Form" to the Owner's Representative at least 72 hours before the demolition work is to begin in accordance with Part 3 of this Section.

Submit equipment and operating sequence.

Include coordination for shut-off, capping temporary services, and other applicable items to ensure no interruption of Owner's operations.

- C. Special Reports. Submit copies of property transmittals as required in Part 3 of this Section.

Submit disposal permits as required in Part 3 of this Section.

- 1.5 SCHEDULING. Conduct work to avoid interference with operations and work in the existing facilities.

Include provisions for temporary services, as required, to ensure no interruptions of Owner operations.

Before any demolition work begins, Contractor shall obtain approval from the Owner's Representative of all necessary outage requests at least 72 hours prior to commencement of Work.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

- 3.1 EXAMINATION. Contractor shall determine if existing walls, slabs, or beams contain electrical or metering conduit and wires. Prior to removal of such structures, Contractor shall investigate each location as thoroughly as necessary to determine the possibility of any buried conduit using every available means possible.

Contractor shall make provisions for the careful and safe removal of the existing facilities to the limits shown, or as directed by the Owner's Representative.

Contractor shall be responsible for any additional or differing demolitions, removals and subsequent repair of exposed surfaces that may be found necessary due to the selection of alternate equipment or due to the requirements of miscellaneous appurtenances to the equipment specified.

- 3.2 PREPARATION. Contractor shall notify the Owner's Representative in writing at least 72 hours prior to the start of any segment of demolition or removal work.

Contractor shall include an estimate of the anticipated number of hours per day or work shifts per day required in order to complete each segment of demolition or removal work.

Contractor shall not start any equipment removal or demolition operations without the concurrence of the Owner's Representative.

- A. Protection. Contractor shall take all necessary measures to prevent damage to structures, injury to occupants of these structures and damage which might result from falling debris or other causes; do not interfere with the use, and safe passage to and from adjacent structures.

Existing piping passing through the area of Work, or new piping installed through the building

which is associated with other processes is to be protected during the demolition work, and all other work, included under this Contract. Included shall be protection from freezing.

Contractor is cautioned that existing piping and equipment might be pressurized or may still contain various amounts of their original contents, sediments or grit, or might contain pockets of trapped gas, or other by-products common to the facilities. Contractor should exercise care in commencing the removal of any segments of piping or equipment and ventilate the pipes. Use of cutting torches and abrasive cutting wheels shall be done only after Contractor has well ventilated the pipelines and verified that they are free of volatile substance.

Do not close or obstruct roadways, sidewalks or passageways adjacent to the Work unless approved by the Owner's Representative.

Conduct all operations with a minimum interference to traffic.

Erect and maintain safety barriers, lights, sidewalk sheds, and other required protective devices around all areas of structural demolition or open excavations. The safety barriers shall not interfere with the Work to be performed under this contract or any other contracts in the area. The Contractor shall coordinate with other contracts in the area to avoid interference of support system.

As a minimum, barriers shall conform to OSHA requirements.

Provide latchable gates for construction access as required.

Maintain flashing warning lights around demolition areas, excavated areas adjacent to roadways, and areas of pedestrian travel.

All open excavations and partially removed floors shall be kept lighted at all times, 24 hours per day, with floodlights and other lighting device as necessary.

- B. Structural Removal Preparation. The extent of structural demolition at any floor level or area shall first be laid out by Contractor using chalk lines, tape, or similar non-permanent markers to demonstrate to the Owner's Representative that the true extent and nature of the removal is completely understood.

After review of the laid-out areas, the Owner's Representative shall advise of corrections, if any, and shall discuss with Contractor any specific details, procedures, barricades, and equipment required to conduct the demolition in a safe and expedient manner. Once satisfied as to Contractor's general plan of operation, the Owner's Representative shall issue notification to proceed with the demolition of the area. Contractor shall not proceed with removals until submittals have been approved and laid-out areas have been reviewed by Owner's Representative.

Contractor shall first provide a saw-cut 1" deep along the outline of the area to be demolished. The saw cut shall be required along all exposed surfaces, except at such locations where the cutting equipment cannot reach. In all cases, the saw cut shall NOT cut through existing reinforcing steel, unless specifically indicated to, or unless so directed by the OWNER'S REPRESENTATIVE.

Following the saw cutting of an area, Contractor shall proceed with the main demolition.

3.3 APPLICATION

- A. Removed Items to Remain Property of Owner. Items designated to be salvaged are to remain the property of the Owner. The inclusion of a particular item shall be interpreted to include all local controls, local starters, disconnects and enclosures.

Items listed and either marked with orange paint marks or tagged with red tags by the Owner are to be removed, cleaned, and transported as directed and stored on-site.

Removed items to remain the property of the Owner shall be thoroughly flushed and scrub-brushed or power washed clean of all sludge, grit, grease, and similar material, and shall be stored at locations as directed by the Owner's Representative.

Storage. Items shall be supported on timber blocking or pallets and shall be covered with plastic coverings for weather protection when so directed by the OWNER'S REPRESENTATIVE.

Tagging. Removed items to remain property of the Owner shall be cleaned and tagged for storage. Tags shall designate item, date removed and stored, number of parts, and other pertinent data such as motor hp, voltage, etc. Corrosion Protection: All items to be stored and requiring grease shall be greased and all parts subject to corrosion shall be protective coated.

All removal, clean-up, transportation and placement in storage of salvaged items shall be by Contractor.

Equipment designated to be removed and disposed of shall become Contractor's property and disposed of in accordance with Part 3 of this Section.

Do not remove from the site any equipment designated to remain the property of the Owner.

Contractor shall provide written documentation of each item that is removed and delivered to the Owner.

Such documentation shall be of a transmittal type format and shall include the following information:

Date of delivery.

Building or area location where delivery was made.

Complete descriptive listing of items and quantities delivered. Signature of Contractor's representative.

Signature of Owner's Representative, acknowledging delivery of the materials.

Contractor shall furnish four (4) copies of each transmittal to the OWNER'S REPRESENTATIVE.

- B. Explosives. The use of explosives is not permitted on the job site.
- C. Supports. The Contractor shall design and provide support system that would protect existing facilities and operations during demolition and as required to complete the Work. The support

design calculations shall be prepared and sealed by a Professional Engineer licensed in the state of New York that may be employed by the Contractor. The support system shall not interfere with the Work to be performed under this contract.

- 3.4 DEMOLITION. The general area in which the demolition work is to be performed shall be left clean and free of debris.

A. Structure Demolition. Refer to Drawings for structures to be demolished.

Existing structures to be demolished shall be cut into fragments and reduced in size as required to facilitate removal and disposal. All demolished material shall be disposed of by the Contractor. Use of demolished material as fill material will not be permitted.

B. Structural Removals. Remove structures to the lines and grades shown unless otherwise directed by the Owner's Representative. Where no limits are shown, the limits shall be 4 inches outside the item to be installed.

Existing reinforcing steel in structural concrete shall NOT be cut or removed along with the associated concrete if the new structural concrete work requires that the existing reinforcing steel be used for splices.

Existing reinforcing steel which is not required for splices, or which is not shown to be embedded in the new concrete shall be neatly trimmed to allow surface patching as required.

C. Concrete. All concrete equipment pads, bases, pipe supports, and similar items are to be completely removed whenever the associated equipment or piping is to be removed, unless specifically designated to remain.

Remaining floor surfaces shall be repaired to leave a neat patch matching the existing floor's appearance, slope, and floor finish.

Concrete for patching shall comply with Section 03300, Cast-In-Place Concrete, except that maximum aggregate size shall be 3/8-inch.

Structural concrete, if shown to be removed or partially removed, shall be neatly removed and patched.

Removal of structural concrete will require temporary support of the adjacent concrete until the new structure of concrete has cured sufficiently to allow the removal of formwork, shoring, and bracing.

Furnish new anchoring materials including bolts, nuts, hangers, welds, and reinforcing steel, as required to install new Work. All anchor bolts must conform to the requirements of Section 05550, Anchorage in Concrete and Masonry.

Furnish temporary supports or bracing of existing structural components as required.

As soon as removal work has otherwise been completed and approved by the Owner's Representative, required filling shall be performed in accordance with Section 02300, Earthwork. The final grade of required backfill in areas outside the prism of construction shall be such as to present a neat appearance. It shall be well drained and shall prevent water from

draining unnecessarily onto adjacent areas.

- D. Railings. Wherever the Drawings indicate that a portion of an existing length of railing is to be removed, Contractor shall remove this railing, plus all existing horizontal rails between this area and the first post beyond this area (on each side of the area). Neatly saw cut all removed rails at the post which is to remain and cap ends unless otherwise shown.
- E. Mechanical. Mechanical removal consists of dismantling and removing existing piping, including residual contents, sediments, or grit, pumps, motors, equipment, supports, and other appurtenances as specified, shown, or required for the completion of the Work.

In general, the notation to remove a particular equipment item shall be interpreted to include the removal of all associated piping, bases, supports, anchors, controls, conduit, wiring and related appurtenances unless specifically designated or ordered to the contrary.

All the HVAC equipment controls, ductwork supports, ductwork insulation, and other devices associated with HVAC equipment to be removed may not be shown on the drawings. The Contractor shall be responsible for the following items in connection with the demolition of equipment:

Removing controls, supports, vents, wiring, and appurtenances from all equipment and devices to be moved or removed.

Removing airflow devices, fire dampers, supports, and duct insulation from all ductwork to be removed.

1. Piping: Piping removal includes cutting, capping, and plugging as required, except that the cutting of existing piping for making connections and tie-ins is to be included under Division 15.

Pipe hangers that support both piping which is to be removed and piping which remains shall be readjusted after the piping is removed.

Remove existing process, water, chemical, gas, fuel oil, and other piping not required for the new Work or existing installations where indicated or where it will interfere with the new Work.

Abandoned underground piping may be left in place unless it interferes with new Work or is shown or specified to be removed.

Abandoned underground piping under paved surfaces shall be filled with flowable controlled density fill material as specified in Section 02300, Earthwork. If any portion of a piping run extends below a paved surface, the entire run shall be filled.

Abandoned underground piping outside the paved surfaces shall be drained and left in place unfilled.

Abandoned manholes may be left in place unless they interfere with new Work or are shown or specified to be removed. For all abandoned manholes, top cones shall be removed or manhole shall be demolished at least four feet down from existing grade. All existing pipes shall be plugged or capped and manhole shall be filled with gravel.

Utility service lines, vents, and drain lines are to be removed or relocated as indicated. Temporary connections of these lines to other portions of the facility are to be provided and maintained by Contractor until the lines can be permanently installed in their new locations.

Any temporary shut-down of these lines for relocation, modification or temporary installation shall in no case exceed 4-hours duration unless otherwise noted or accepted by Owner's Representative.

Any line remaining in service shall, at all times, be protected from clogging or other damage during construction and from freezing throughout the duration of this Contract.

Purge volatile gases and make safe all process lines, fuel lines, and tanks prior to removal or capping.

Piping to be removed shall be removed to the nearest solid support.

Cut off and properly cap, to the satisfaction of the Owner's Representative, both ends of remaining piping that passes through and is embedded in existing walls to the satisfaction of the Owner's Representative.

Properly cap the remaining piping left open by demolition work.

When piping is to be altered, install temporary plugs or caps in the remaining pipe until the piping modifications are made.

2. Waste, Vent, and Drain Lines. Plug upstream ends of remaining pipe with cleanouts and plugs.

Remove vent stacks, where shown, which pass through existing roofs. Properly patch and seal watertight penetration through the roof that is left by removal of the stack. All necessary precaution shall be taken to ensure that any existing roofing warranties shall not be rendered void by the subject work.

3. Potable Water Piping. Conform with all applicable codes and requirements when making changes to potable water piping.

Pressure test and disinfect in accordance with related piping installation sections, and any local codes all portions of the potable water system that have been altered or opened.

- F. Equipment Demolition. All equipment, unless otherwise specified, shall be removed and shall become the property of Contractor.

The Contractor shall be responsible for the removal of process equipment, pumps, and associated motors, piping, and valves and all other appurtenances associated with item being removed. Existing piping around equipment to be demolished shall be cut, removed, abandoned, disconnected, and/or salvaged as indicated on Drawings or as required.

Equipment to be removed shall be disconnected, dismantled, and removed as required in such

a manner as to minimize disturbance or damaging adjacent construction. At any point of location where new work is to be connected or installed, the removal of existing work shall be done so as to facilitate the new installation work to the maximum possible extent.

All equipment to be removed except for the items indicated in the Contract Documents shall become the property of the Contractor and shall be promptly removed from the jobsite. Reuse of existing materials in the Work will not be permitted.

- G. Sitework Demolition. The demolition of existing drives, curbs, walks, dikes, and similar items shall be scheduled and performed to minimize inconvenience to the Owner.
- H. Electrical Demolition. The notation to remove a piece of equipment as indicated on the Drawings shall be interpreted to also include the removal of all electrical equipment, conduit, wires and appurtenances associated with the equipment. This includes, but is not limited to, all wires and conduit from the motor to the equipment; and all disconnects, remote switches and starters; all controls, alarms, conduit and instrumentation, both local and remote, and all supports, braces and hangers.

Electrical removals also consist of the removal of existing transformers, distribution switchboards, control panels, motors, conduits and wires, poles and overhead wiring, panel boards, lighting fixtures, and miscellaneous electrical equipment all as shown, specified, or required to perform the Work.

All removals of electrical equipment and appurtenances shall be in complete conformance with the requirements of Division 16.

It is Contractor's responsibility as part of this Work to maintain all existing electrical systems including power, lighting, intercommunication and instrumentation in continuous, acceptable operation. During the period of construction, some wiring may be cut or damaged accidentally or otherwise. Contractor shall install and maintain all temporary wiring (as approved by the Owner) required to keep all electrical apparatus in acceptable operating condition.

As soon as possible, Contractor shall reinstall cut or damaged circuits in their permanent locations.

Where any electrical system component is damaged during work on this project and replaced in accordance with this Section, the replaced work shall meet all requirements specified in Division 16 even though the damaged components may not have met the requirements of Division 16 prior to being damaged. Where existing electrically operated equipment is relocated, the power and control wiring and appurtenant devices shall be relocated to accommodate it. Installations and materials shall conform to requirements specified in Division 16.

Electrical equipment, conduit, wire and fixtures shall be relocated as necessary to accommodate installation of new and relocated electrically operated equipment and to accommodate structural alterations to existing facilities such as floors, walls, entrance ways, ducting, process equipment and piping.

1. Electrical Equipment and Fixtures: Remove existing electrical equipment and fixtures where shown or required with such care as may be required to prevent unnecessary damage, to keep existing systems in operation and to keep the integrity

of the grounding systems.

2. Switchboards. Remove and modify distribution switchboards as shown.

Disconnect and dismantle switchboards that are to be removed. Dispose of all components off the site.

Remove circuit breakers and other control equipment that will no longer be used from modified switchboards unless otherwise shown or specified.

Cut all new openings into the modified switchboard panels and dress smooth to the dimensions required for the installation of the new equipment.

3. Motors. Disconnect and remove motors where shown or specified.

Remove from the site motors not designated to become the property of the Owner.

Store in an enclosed, heated storage area motors or other electrical gear designated for reuse.

4. Conduit and Wire. Remove conduits and wires where shown, or associated with equipment to be removed.

Cut abandoned conduits in floor or ceiling slabs, or in walls, flush with the slab or wall at the point of entrance. Plug the conduit suitably and repair the area in a flush, smooth, approved manner.

Disassemble and remove from the site exposed conduits and their supports. Repair all areas of work to prevent rust spots on exposed surfaces.

Dispose of all removed wire, conduits, supports, and appurtenances.

5. Underground Ducts. Remove wiring in the underground duct system where shown or otherwise required.

The storage and salvage of all such wiring shall conform to the requirements of Part 3 of this Section.

Verify the function of all wiring before disconnecting and removing it.

Plug ducts that are not to be reused, where they enter buildings and make watertight.

6. Direct-Burial Cable. Abandon direct-burial cable where shown.

Disconnect such cable at both ends of the run.

Cut back the cable to the point of entrance of a building or structure.

Patch and make watertight all openings in buildings for entrance of abandoned direct burial cable.

7. Lighting Fixtures. Remove and relocate lighting fixtures as shown.

Remove fixtures from the site that are not to be relocated.

Carefully remove and re-hang relocated fixtures where shown.

8. Panelboards. Remove panelboards where shown and dispose of off site. Perform all cutting and patching necessary for the removal and replacement of panelboards.

9. Miscellaneous Electrical Equipment. Remove wall switches, receptacles, starters, and other miscellaneous electrical equipment as required and dispose of off the site.

Remove all equipment with care to minimize damage to architectural and structural members.

Repair any damage incurred as herein specified.

- I. Alterations and Closures. Conform to all applicable Specifications, the Drawings, and the directions of the Owner's Representative.

- J. Cutting and Drilling: Repair all holes in an approved manner where alterations require cutting or drilling into existing floors, walls and roofs.

Repair such openings with the same or matching materials as the existing floor, wall, or roof, or as otherwise directed by the Owner's Representative.

Finish smoothly all repairs unless otherwise directed by the Owner's Representative.

- K. Openings. Close and seal openings in existing concrete slabs, ceilings, masonry walls, floors, and partitions as shown or otherwise directed by the Owner's Representative.

Key new Work into the existing in an acceptable manner.

In general, use the same or matching materials as the existing adjacent surface.

Make the finished closure a smooth, tight, sealed, permanent closure acceptable to the Owner's Representative.

Saw cut new openings in existing concrete and masonry walls for windows, passageways, doors or other openings. Patch saw overcuts in concrete walls. Toothing in new masonry at corners of masonry walls.

3.5 SALVAGE.

- A. Items to Be Salvaged By Owner. None.

- B. Items to Be Salvaged By Contractor. Removal and salvage of any item of equipment or materials shall include removal and salvage of all associated accessories, fasteners, piping, wiring, supports, associated electrical starters and devices, baseplates and frames, and all other appurtenances, unless otherwise directed.

Items that will be salvaged by Contractor shall be as indicated in the Contract Documents.

Existing materials and equipment to be removed by the Contractor, and reused, as a part of the work as indicated, shall remain the property of the Owner.

The Contractor shall pile all materials and equipment specified herein or indicated to be salvaged and not reused at a location of the Owner's choosing on the project site.

The Contractor shall carefully remove, in a manner to prevent damage, all materials and equipment specified herein or indicated to be salvaged and reused or to remain the property of the Owner. The Contractor shall store and protect salvaged items specified or indicated to be reused in the work. Any items damaged in removal, storage, or handling through carelessness or improper procedures shall be replaced by the Contractor in kind or with new items.

All other existing materials and equipment removed and disposed of / demolished by the Contractor that are not to be reused in the work and not to remain property of the Owner, shall become the property of the Contractor, and shall be removed from the jobsite.

- 3.6 REPAIR/RESTORATION. Where structures to be demolished are connected to structures to remain, the existing construction shall be removed in a careful manner so that adjacent construction, piping, or facilities to be left in place are not damaged. The Contractor will be held responsible for any damage thereto because of his operations. Temporary supports shall be used where and as required for the support of the existing facilities. Holes and damage resulting from removal operations shall be filled, reconstructed, repaired, and finished to match and conform to adjacent surfaces and construction as indicated on the drawings or as determined by the Owner's Representative.

Contractor shall be responsible for providing all such minor repairs, patches and cover plates, whether specifically shown or described or not.

Repair damage done to facilities to remain, or to any property belonging to the Owner or occupants of the facilities.

- A. Concrete. Void spaces left by structure removal in concrete surfaces shall be filled as shown and shall be completed in accordance with Section 02300, Earthwork.

Structural concrete, if shown to be partially removed, and which has rough or raw edges not covered or otherwise "finished" by new structural work, shall be neatly repaired using textured surface finish materials to blend in with the surrounding concrete surfaces.

- B. Exposed Surfaces. Repair all surfaces of walls, floors, ceilings, or other areas which are exposed by any of the removals specified herein or in other Sections of these Specifications, or shown on the Drawings, and which will remain as architecturally finished surfaces and which have holes, scars, chipped or other damaged surfaces revealed by the removal.

Use the same or matching materials as the existing surface or as may be otherwise directed by the Owner's Representative.

- C. Junction Points. After removal of part or all of concrete or masonry walls, slabs and like work which tie into new Work or existing work neatly repair the point of junction to leave only finished edges and surfaces exposed.

D. Painting. Not Applicable.

3.7 CLEANING. Upon completion of the Work, remove all materials, equipment, waste, and debris of every sort and leave the premises clean, neat, and orderly.

A. Pollution Controls. Use water sprinkling, temporary enclosures, outside air ducting, and other suitable methods to limit the amount of dust and dirt rising and scattering in the air to the lowest practical level.

Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

Clean adjacent structures, facilities, and improvements of dust, dirt, and debris caused by demolition operations.

Do not rinse into storm sewers without obtaining prior acceptance of the Owner's Representative.

Return adjacent areas to conditions existing prior to the start of the Work.

Comply with governing regulations pertaining to environmental protection.

B. Disposal of Materials: Remove from the site and properly dispose of all debris resulting from the demolition operations as it accumulates.

Remove and take from the site all concrete, brick, tile, concrete block, roofing materials, reinforcement, structural or miscellaneous metals, plaster, wire mesh and other items contained in or upon the structure.

Do not re-use demolished items.

C. Off-Site Disposal. Dispose of all demolition materials, residual pipe contents, debris, and old concrete off the site and off the Owner's property in conformance with all existing applicable laws regulations.

Obtain permit or written permission of the property owner or governing entity on whose property the materials and debris are placed. Furnish copy to the Owner's Representative.

END OF SECTION 02050

SECTION 02240 – DEWATERING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes construction dewatering.
- B. Related Sections:
 - 1. Division 2 Section "Earthwork" for excavating, backfilling, site grading, and for site utilities.

1.2 PERFORMANCE REQUIREMENTS

- A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.
 - 1. Delegated Design: Design dewatering system, including comprehensive engineering analysis using performance requirements and design criteria indicated.
 - 2. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, that excavation does not flood, and that damage to subgrades and permanent structures is prevented.
 - 3. Prevent surface water from entering excavations by grading, dikes, or other means.
 - 4. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
 - 5. Remove dewatering system when no longer required for construction.

1.3 SUBMITTALS

- A. Shop Drawings: For dewatering system. Show arrangement, locations, and details of wells and well points; locations of risers, headers, filters, pumps, power units, and discharge lines; and means of discharge, control of sediment, and disposal of water.
 - 1. Include layouts of piezometers and flow-measuring devices for monitoring performance of dewatering system.
 - 2. Include a written plan for dewatering operations including control procedures to be adopted if dewatering problems arise.
- B. Delegated Design Submittal: For dewatering system indicated to comply with performance requirements and design criteria.

- C. Qualification Data: For qualified Installer.
- D. Field quality-control reports.
- E. Other Informational Submittals:
 - 1. Photographs: Show existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by dewatering operations.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer that has specialized in design of dewatering systems and dewatering work.
- B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Preinstallation Conference: Conduct conference at location designated by Owner's Representative.
 - 1. Review methods and procedures related to dewatering including, but not limited to, the following:
 - a. Inspection and discussion of condition of site to be dewatered including coordination with temporary erosion control measures and temporary controls and protections.
 - b. Geotechnical borings.
 - c. Proposed site clearing and excavations.
 - d. Existing utilities and subsurface conditions.
 - e. Coordination for interruption, shutoff, capping, and continuation of utility services.
 - f. Construction schedule. Verify availability of Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - g. Testing and monitoring of dewatering system.

1.5 PROJECT CONDITIONS

- A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:
 - 1. Notify Owner's Representative no fewer than two days in advance of proposed interruption of utility.
 - 2. Do not proceed with interruption of utility without Owner's Representative's written permission.
- B. Project-Site Information: The results of geotechnical borings has been prepared for this Project

and is available for information only. Owner, Engineer and/or Owner's Representative will not be responsible for interpretations or conclusions drawn from this data.

1. Make additional test borings and conduct other exploratory operations necessary for dewatering.
2. The results of the geotechnical borings are included in the Appendices of these Contract Documents.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.
 1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site and surrounding area.
 2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.
- B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- C. Provide temporary grading to facilitate dewatering and control of surface water.
- D. Monitor dewatering systems continuously.
- E. Promptly repair damages to adjacent facilities caused by dewatering.
- F. Protect and maintain temporary erosion and sedimentation controls, which are specified on the Contract Drawings during dewatering operations.

3.2 INSTALLATION

- A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.

1. Space well points or wells at intervals required to provide sufficient dewatering.
2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.
- B. Before excavating below ground-water level, place system into operation to lower water to specified levels. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.
- C. Provide an adequate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Install sufficient dewatering equipment to drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.
 1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
- D. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
 1. Maintain piezometric water level a minimum of 24 inches below surface of excavation.
- E. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others. Provide sumps, sedimentation tanks, and other flow-control devices as required by NYSDOT Standard Specification Volume 2, Section 209 – Soil Erosion and Sediment Control.
- F. Provide standby equipment on site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, restore damaged structures and foundation soils at no additional expense to Owner.
 1. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.
- G. Damages: Promptly repair damages to adjacent facilities caused by dewatering operations.

END OF SECTION 02240

SECTION 02300 – EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preparing subgrades for slabs-on-grade, walks, pavements and grasses.
2. Drainage course for concrete slabs-on-grade.
3. Subbase course for concrete walks and pavements.
4. Subbase course and base course for asphalt paving.
5. Subsurface drainage backfill for walls and trenches.
6. Excavating and backfilling trenches for utilities and pits for buried utility structures.

1.2 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

C. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Owner's Representative. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Owner's Representative. Unauthorized excavation, as well as remedial work directed by Owner's Representative, shall be without additional compensation.

D. Fill: Soil materials used to raise existing grades.

E. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 3/4 cu. yd. or more in volume that exceed a standard penetration resistance of 100 blows/2 inches when tested by a geotechnical testing agency, according to ASTM D1586.

- F. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- G. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- H. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.3 SUBMITTALS

- A. Product Data: For each type of the following manufactured products required:
 - 1. Geotextiles.
 - 2. Controlled low-strength material, including design mixture.
 - 3. Warning tapes.
- B. Qualification Data: For qualified testing agency.
- C. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:
 - 1. Classification according to ASTM D2487.
 - 2. Laboratory compaction curve according to ASTM D 1557.
- D. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth moving operations. Submit before earth moving begins.

1.4 QUALITY ASSURANCE

- A. Blasting: Not permitted.
- B. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E329 and ASTM D3740 for testing indicated.
- C. Preexcavation Conference: Conduct conference at Project site.

1.5 QUALITY CONTROL

- A. Provide the following analysis from a third party soil material testing laboratory:
 - 1. Gradation
 - 2. Effective size
 - 3. Uniformity coefficient

4. Standard Falling Head permeability test (ASTM A5084)

1.6 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.
 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner's Representative and authorities having jurisdiction.
 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner's Representative or authorities having jurisdiction.
- B. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth moving operations.
- C. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures, specified in Division 1 Section "Temporary Facilities and Controls," are in place.
- D. The following practices are prohibited within protection zones:
 1. Storage of construction materials, debris, or excavated material.
 2. Parking vehicles or equipment.
 3. Foot traffic.
 4. Erection of sheds or structures.
 5. Impoundment of water.
 6. Excavation or other digging unless otherwise indicated.
 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- E. Do not direct vehicle or equipment exhaust towards protection zones.
- F. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Suitable Borrow Material – Shall be a well graded gravel material meeting NYSDOT Specification 203-2.02(A) Subgrade Area Material.

- C. Suitable Material Backfill – As per NYSDOT Standard Specification 203 – 1.08.
- D. Select Granular Fill – As per NYSDOT Standard Specification Item 203.07 but as modified below:
- E. Subbase Course - As per NYSDOT Standard Specification Item 304.12. NYSDOT Standard Specification Item 304.14 is also acceptable.
- F. Granular Fill, Slope Protection - As per NYSDOT Standard Specification Item 203.0801.
- G. Structural Fill – To be used where indicated on drawings. The material shall have the following gradation:

<u>Sieve Size</u>	<u>% Finer</u>
1 ½ inch	100
¾ inch	70 to 92
⅜ inch	50 to 70
No. 4	35 to 55
No. 30	12-25
No. 200	0-12

- H. Select Structural Fill – To be used where indicated on drawings. The material shall be NYSDOT Type 2 crushed stone and shall have the following gradation:

<u>Sieve Size</u>	<u>% Finer</u>
2 inch	100
1/4 inch	25 to 60
No. 40	5-40
No. 200	0-10

- I. Drainage Material - Underdrain, Filter Type 1 - As per NYSDOT Standard Specification Item 605.0901.

2.2 GEOTEXTILES

- A. Subsurface Drainage Geotextile: Tencate / Mirafi 1160N or approved equal.
- B. Separation Geotextile: Tencate / Mirafi 500X or approved equal

2.3 CONTROLLED LOW-STRENGTH MATERIAL

- A. Controlled Low-Strength Material: Meet NYSDOT Specification Item 204.01.

2.4 ACCESSORIES

- A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.
- D. After clearing and grubbing, and removal of all topsoil and organic matter, the resulting subgrade should be proof-rolled under observation of geotechnical engineer by at least three passes of a minimum 7-ton smooth drum roller in static mode.
- E. Any areas which pump or weave during proof-rolling should be undercut and stabilized with structural fill as directed by a geotechnical engineer.

3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXPLOSIVES

- A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be

authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
 2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
 - a. 24 inches outside of concrete forms other than at footings.
 - b. 12 inches outside of concrete forms at footings.
 - c. 6 inches outside of minimum required dimensions of concrete cast against grade.
 - d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
 - e. 6 inches beneath bottom of concrete slabs-on-grade.
 - f. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.
- B. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by Owner's Representative. The Contract Sum will be adjusted for rock excavation according to unit prices included in the Contract Documents. Changes in the Contract Time may be authorized for rock excavation.
1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation.
 - a. Intermittent drilling; ram hammering; or ripping of material not classified as rock excavation is earth excavation.
 2. Rock excavation includes removal and disposal of rock. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:
 - a. 24 inches outside of concrete forms other than at footings.
 - b. 12 inches outside of concrete forms at footings.
 - c. 6 inches outside of minimum required dimensions of concrete cast against grade.
 - d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
 - e. 6 inches beneath bottom of concrete slabs-on-grade.
 - f. 12 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or

42 inches wide.

3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
 - 2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.
- B. Excavations at Edges of Tree- and Plant-Protection Zones:
 - 1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to lines and dimensions indicated in details shown on the contract documents.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
 - 1. Clearance: 12 inches each side of pipe or conduit.
- C. Trench Bottoms: Excavate trench bottoms to lines and dimensions indicated in details shown on the contract documents. Remove projecting stones and sharp objects along trench subgrade.
 - 1. If Owner's representative determines that unsatisfactory soil is present, continue excavation and replace with compacted Type 2 Crushed Stone – NYSDOT Item No. 304.12.
- D. Trenches in Tree- and Plant-Protection Zones:
 - 1. Hand-excavate to indicated lines; cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
 - 2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with

installation of utilities.

3.8 SUBGRADE INSPECTION

- A. Notify Owner's Representative when excavations have reached required subgrade.
- B. If Owner's Representative determines that unsatisfactory soil is present, continue excavation and replace with compacted structural fill or lean concrete material as directed.
- C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
 - 1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
 - 2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by the Owner's representative, and replace with compacted backfill or fill as directed.
- D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
- E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Owner's Representative, without additional compensation.

3.9 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Engineer.
 - 1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Owner's Representative.

3.10 STORAGE OF SOIL MATERIALS

- A. Stockpile, borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 - 1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.

2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

- B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.12 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with concrete to elevation of bottom of footings. Concrete is specified in Division 3 Section "Cast-in-Place Concrete."
- D. Trenches under Roadways: Backfill trenches excavated under Roadways with materials specified in the pavement restoration details as shown on the contract drawings.
- E. Backfill voids with Suitable Material Backfill soil while removing shoring and bracing.
- F. Place and compact initial backfill of subbase material to a height of 12 inches over the pipe or conduit.
 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- G. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- H. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.
- I. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.13 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use suitable material.
2. Under walks and pavements, use select granular fill material.
3. Under steps and ramps, use select granular fill material.
4. Under building slabs, use select granular fill material.
5. Under footings and foundations, use select granular fill material.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.14 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
1. Under structures, building slabs, steps, and pavements, recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
 2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
 3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
 4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.16 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
1. Unpaved Areas: Plus or minus 1 inch.
 2. Walks: Plus or minus 1 inch.
 3. Pavements: Plus or minus 1/2 inch.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.17 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:
1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
 2. Place base course material over subbase course under hot-mix asphalt pavement.
 3. Shape subbase course and base course to required crown elevations and cross-slope grades.
 4. Place subbase course and base course 6 inches or less in compacted thickness in a single layer.
 5. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 6. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.18 FIELD QUALITY CONTROL

- A. Testing Agency: Owner shall engage a qualified geotechnical Engineering testing agency to perform tests and inspections. The Owner's Representative shall supervise all testing activities.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed

to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

- D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
 - 1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
 - 2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length, but no fewer than two tests.
 - 3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length, but no fewer than two tests.
- E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.19 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.20 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 02300

SECTION 02456 - STEEL SHEET PILES

PART 1 - GENERAL

1.1 SCOPE

- A. Section includes materials and installation for sheet, continuous interlocking flat web, and continuous interlocking steel sheet piles.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at the Project Site.

1.3 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For steel H piles. Show fabrication and installation details for piles, including details of driving points, splices, and pile caps.
 - 1. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
- C. At least 2 weeks prior to fabrication, submit to ENGINEER, two copies of steel producer certificates in accordance with ASTM A1011/A101M, and mill test reports in accordance with CAN/CSA-G40.20/G40.21.
- D. Provide ENGINEER with copy of certification for fusion welding in accordance with CSA W47.1 and CSA W47.1S1.
- E. Pile-Driving Equipment Data: Include type, make, and rated energy range; weight of striking part of hammer; weight of drive cap; and type, size, and properties of hammer cushion.
- F. Pile-driving records.
- G. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Inspection and testing of steel sheet piling material will be carried out by testing laboratory designated by the ENGINEER at any time during the course of the work.
- C. Materials inspected or tested by the testing laboratory which fail to meet contract requirements will be rejected.
- D. Where tests or inspections by designated testing laboratory reveal work not in accordance with contract requirements, Contractor to pay costs for additional tests or inspections. Engineer to approve corrected work.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Use slings for lifting piling so that mass is evenly distributed and piling is not subject to excessive bending stresses.
- B. Store sheet piling on level ground or provide supports so that sheet piling is level when stored.
 - 1. Provide blocking at spacing not exceeding 5 meters so there is no excessive sagging in the piling.
 - 2. Overhang at ends not to exceed 0.5 meters.
 - 3. Block between lifts directly above blocking in lower lift.
- C. If material is stock-piled on structure, ensure that structure is not overloaded.

1.6 WASTE MANAGEMENT AND DISPOSAL

- A. Separate waste materials for reuse and recycling in accordance with Section 01355.
- B. Remove from site and dispose of packaging materials at appropriate recycling facilities.
- C. Divert unused metal materials from landfill to metal recycling facility for disposal approved by ENGINEER.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel sheet piles: to CAN/CSA-G40.21, including chemical and mechanical requirements grade 350W, and following:
- B. Continuous interlocking flat web with minimum web thickness 0.5 inches and minimum mass of 39.9 lbs per square foot.
- C. Continuous interlocking [Z] [trough] section:
 - 1. Minimum effective section modulus of 60.7 cubic inches per foot of wall.
 - 2. Minimum flange thickness of 0.6 inches.
 - 3. Minimum web thickness of 0.5 inches.
- D. Sheet piling: section modulus of 60.7 cubic inches per foot or equivalent as approved by ENGINEER.
 - 1. Special corners: provide fabricated special corners as specified by manufacturer for type of sheet piling supplied.
 - 2. Interlocks: to be such that section of interlock bar of 3.2 feet minimum length will pass

along full length of pile without binding.

3. Mark each piece of sheet piling legibly by stencilling or die-and-stamping with following information.
 - a. Heat Number.
 - b. Manufacturer's Name.
 - c. Length and Section Number.
4. Do not precut lifting or slinging holes in sheet piles.
- E. Structural steel for wales, bearing plates, wales splices, capping channels, support angles and miscellaneous steel: to CAN/CSA-G40.21, Grade 300W.
- F. Tie rods, sleeve nuts and turnbuckles.
 1. Tie rods: to ASTM A615
 2. Tie rods: to continuously threaded bar with double corrosion protection.
 3. Sleeve nuts, and connector sleeves: to have load capacity in excess of capacity of tie rod.
 4. Preassemble, mark and test tie rod assemblies in shop. Align threaded connection to following tolerances at sleeve nut or connector sleeve: $[1/80]$ of normal rod diameter, deviation of centre line, 1 in 160.
- G. Nuts and bolts: hexagon nuts, bolts, and washers: to ASTM A307.
- H. Backfill material: to Section NYSDOT Standard Specification Volume 2, Section 203 – Excavation and Embankment and as indicated.

2.2 SOURCE QUALITY CONTROL: HOT ROLLED STEEL SHEET PILING

- A. Provide results of tests of sheet piling material to be used on project as follows:
 1. One tension test and one bend test from each heat for quantities of finished materials less than 50 tons.
 2. Two tension tests and two bend tests from each heat for quantities of finished material exceeding 50 tons.
- B. Tension tests in accordance with CAN/CSA-G40.20/G40.21. Bend tests in accordance with ASTM A6/A6M.

2.3 SOURCE QUALITY CONTROL: COLD FORMED STEEL SHEET PILING

- A. Provide results of tension tests of sheet piling material to be used on project as follows:
 1. One tension test from each heat for quantities of finished material less than 50 tons.

2. Two tension tests from each heat for quantities of finished material exceeding 50 tons.
- B. Tension tests in accordance with CAN/CSA-G40.20/G40.21.
- C. Provide results of bend tests of sheet piling materials to be used on project as follows:
 1. Bend tests in accordance with ASTM A6/A6M, with following amendments:
 - a. S14.1 Bend tests to be performed with material in condition as used in cold forming operation. Three tests to be made from each heat and each thickness of material produced. Bend test specimens to be taken from edge of each coil. Longitudinal axis of specimen to be transverse to coil rolling direction.
 - b. S14.1.1 Except as provided below, bend test specimens to have minimum width to thickness ratio of 8, with both edges parallel throughout section in which bending occurs, and is maintained.
 - c. S14.2 Minor surface separations less than 0.8 mm in depth related to superficial steel surface or subsurface discontinuities to not cause rejection. Surface separations in excess of 0.8mm depth and / or cracks normal to metal surface to cause rejection.

PART 3 - EXECUTION

3.1 DRIVING PILES

- A. Do not begin pile installation until required quality control tests have been completed and test results approved by the ENGINEER.
- B. Submit full details of methods and sequence of installation of piling to ENGINEER for approval prior to start of pile installation work. Details must include templates, bracing, setting, and driving sequence and number of piles in panels for driving.
- C. General: Continuously drive piles to elevations or penetration resistance indicated using vibratory methods. Establish and maintain axial alignment of leads and piles before and during driving.
- D. Heaved Piles: Redrive heaved piles to tip elevation at least as deep as original tip elevation with a driving resistance at least as great as original driving resistance.
- E. Driving Tolerances: Drive piles without exceeding the following tolerances, measured at pile heads:
 1. Location: 4 inches (102 mm) from location indicated after initial driving, and 6 inches (152 mm) after pile driving is completed.
 2. Plumb: Maintain 1 inch (25 mm) in 48 inches (1219 mm) from vertical, or a maximum of 4 inches (102 mm), measured when pile is aboveground in leads.
 3. Batter Angle: Maximum 1 inch (25 mm) in 48 inches (1219 mm) from required angle, measured when pile is aboveground in leads.

- F. Withdraw damaged or defective piles and piles that exceed driving tolerances, and install new piles within driving tolerances.
- G. Cut off tops of driven piles square with pile axis and at elevations indicated.
- H. Pile-Driving Records: Maintain accurate driving records for each pile, compiled and attested to by a qualified professional engineer.

3.2 OBSTRUCTIONS

- A. If obstruction encountered during driving, leave obstructed pile and proceed to drive remaining piles.
- B. Advise ENGINEER immediately if not possible to drive pile to full penetration and obtain direction from ENGINEER on further steps required to complete work.

3.3 HOLES

- A. Patch holes in sheet pile wall, except where permanent holes are indicated.
 - 1. Use excess material equal in thickness to that of the piling to patch holes and overlap not less than hole diameter.
 - 2. Weld to develop full strength of plate.

3.4 CUTTING

- A. When flame cutting tops of piles, and flame cutting holes in piles approved by ENGINEER, use following procedure.
 - 1. When air temperature is above 0 degrees C, no pre-heat is necessary.
 - 2. When air temperature is below 0 degrees C, pre-heat until steel 25 mm on each side of line of cut has reached a temperature very warm to hand (approximately 35 degrees C). Tempil sticks may be used to measure temperature.
 - 3. Use torch guiding device to ensure smooth round holes or straight edges.
 - 4. Make cut smooth and free from notches throughout thickness. If grinding is employed to remove notch or crack, finished radius to be minimum 5 mm.

3.5 SPLICING

- A. Use full length piles unless splicing is indicated or approved on site by ENGINEER.

3.6 BACKFILLING

- A. Backfill in accordance with NYSDOT Standard Specification Volume 2, Section 203 – Excavation and Embankment and as indicated.

3.7 FIELD QUALITY CONTROL

NEW YORK STATE THRUWAY AUTHORITY
NIAGARA PUMP HOUSE UPGRADE

C&S #185.026.004

- A. Special Inspections: Contractor will engage a qualified special inspector to perform inspections.
- B. Testing Agency: Contractor will engage a qualified testing agency to perform tests and inspections.
- C. Tests and Inspections:
 - 1. Dynamic Pile Testing: High-strain dynamic monitoring shall be performed and reported according to ASTM D4945 during initial driving and during restriking on 3 percent of piles.
 - 2. Weld Testing: In addition to visual inspection, welds shall be tested and inspected according to AWS D1.1/D1.1M.

END OF SECTION 02456

SECTION 02516 - ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Saw cutting.
2. Asphalt patching.
3. Asphalt paving.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

1. Job-Mix Designs: For each job mix proposed for the Work submit material product data and asphalt design.

B. Manufacturer's Certificate:

1. Certify HMA Products meet or exceed New York State Department of Transportation (NYSDOT) 2026 Standard Specifications:
 - a. Section 207: Geosynthetics
 - b. Section 401: Plant Production
 - c. Section 404: Asphalt Pavements
 - d. Section 407: Tack Coat

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer with NYSDOT approved materials and batch plant equipment.

B. Installer: Company specializing in performing work of this section with minimum three years experience.

C. Perform work in accordance with NYSDOT Standard Specifications:

1. Section 404: Asphalt Pavements
2. Section 407: Tack Coat

D. Mixing Plant:

1. Obtain materials from same source throughout.
2. Conform to the NYSDOT Standard Specifications:
 - a. Section 401: Plant Production.
 - b. Section 404: Asphalt Pavements

1.4 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
 1. Perform work in accordance with NYSDOT Standard Specifications, Section 404, Table 404-1 – Temperature and Seasonal Requirements.
- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature in accordance with NYSDOT Standard Specifications, Section 640-3.02 – Application of Pavement Markings (Reflectorized Pavement Markings).

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. Aggregate for Base, Binder, and Top Course Mix: In accordance with NYSDOT Standard Specifications: Section 401-2.02 (Aggregates).
- B. Mineral Filler: Finely ground particles of limestone, hydrated lime, or other mineral dust, free of foreign matter and in accordance with NYSDOT Standard Specifications: Section 703-08 (Mineral Filler).

2.2 ASPHALT MATERIALS

- A. Asphalt Binder: ASHTO MP1, PG 64-22.
- B. Tack Coat: Emulsified asphalt in accordance with NYSDOT Standard Specifications Section 407-2, Materials (Tack Coat).

2.3 AUXILIARY MATERIALS

- A. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.

2.4 MIXES

- A. Warm-Mix Asphalt: asphalt plant mixes meeting NYSDOT Standard Specifications, Section 404 – 2.02 (Composition of Mixtures) for each pavement course and complying with the following requirements:
1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
 2. The use of the WMA Technology shall comply with the latest technology supplier's approved "Production, Design and Mixture Verification Procedures."
 3. Mixes to be placed at thickness noted on the plans.
 4. Base Course: NYSDOT Item 404.3789.
 5. Binder Course: NYSDOT Item 404.1989.
 6. Top Course: NYSDOT Item 404.0983.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Prepare subbase in accordance with NYSDOT Standard Specifications: Section 304 (Subbase Course). Prior to installation of the subbase, Geotextile Separation Fabric is to be installed on the compacted subgrade.
1. Refer to the plans for the location of the Geotextile Separation Fabric.
 - a. Requirements for Geotextile Separation Fabric is as follows:
 - b. Shall be in accordance with the NYSDOT Approved List for Geosynthetics for Highway Construction, for the following parameters:
 - c. Geotextile Separation: (place beneath roadway pavement)
 - d. Meet requirements of Separation (S). Default Strength Class 2.
- B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
- C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 SAW CUTTING

- A. Existing pavement and overlay shall be saw cut perpendicular to the roadway surface along neat lines, and to the depth indicated on the plans and typical sections. A power saw approved by the Consultant shall be used for cutting asphalt surface course and asphalt overlay. A power saw shall

be used for cutting concrete pavement. After the existing asphalt pavement, concrete pavement, asphalt surface course or overlay has been saw cut through, the contractor may use pry bars, pneumatic tools or other methods approved by the Consultant, to pry loose the existing pavement from that pavement which is to remain. A pavement breaker, under the supervision of the Consultant, may be used to break up the pavement to be removed after the pavement has been completely saw cut through and completely free from the pavement to remain.

3.3 PATCHING

- A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade. Fill excavated pavements with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface
- B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseal concrete pieces firmly.
 - 1. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.

3.4 TACK COAT

- A. Apply tack coat in accordance with NYSDOT Standard Specifications: Section 407-3.02 (Application of Tack Coat).
- B. Apply tack coat to contact surfaces of curbs and precast drainage structures.
- C. Coat surfaces of manhole and catch basin frames with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.
- D. Paving over a tack coat should not commence until the emulsion has broken (goes from brown to black) or is tacky when touched.
- E. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
- F. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.5 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
- B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.

- C. Tack Coat: Apply in accordance with NYSDOT Standard Specifications: Section 407-3.02 (Application of Tack Coat).

3.6 ASPHALT PLACING

- A. Install Work in accordance with NYSDOT Standard Specifications, Section 404: Asphalt Pavements.
- B. Machine place asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
 - 1. Spread mix at minimum temperature in accordance with Table 404-1 (Temperature Requirements).
 - 2. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- C. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
- D. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.7 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of asphalt course.
 - 1. Clean contact surfaces and apply tack coat to joints.
 - 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
 - 3. Offset transverse joints, in successive courses, a minimum of 24 inches.

3.8 COMPACTION

- A. Perform work in accordance with NYSDOT Standard Specifications, Section 404-3.07 – Compaction.
- B. All vibratory compaction equipment for shall be on the NYSDOT Approved List.
- C. General: Begin compaction as soon as placed asphalt paving will bear roller weight without excessive displacement. Compact paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
- D. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- E. Erect barricades to protect paving from traffic until mixture has cooled enough not to become

marked.

3.9 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
 - 1. Base and Binder Course: Plus or minus 1/2 inch.
 - 2. Top Course: Within 1/4 inch.
- B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
 - 1. Base and Binder Course: 1/4 inch.
 - 2. Top Course: 1/8 inch.
 - 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.10 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Remove and replace or install additional asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.11 DISPOSAL

- A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

END OF SECTION 02516

SECTION 02575 - RESTORATION OF SURFACES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Restoration of existing facilities damaged as a result of this project. Items included but are not limited to:
 - 1. Pavement, curbs, concrete walks, and gutters
 - 2. Culverts
 - 3. Underground Utilities
 - 4. Lawn and landscaped areas
 - 5. Traffic Signs
 - 6. Ditches and Swales

1.2 REGULATORY REQUIREMENTS. These restoration specifications are minimum requirements and in the event that the governing regulatory agency or agencies have more stringent requirements, those requirements shall be adhered to.

- A. New York State Department of Environmental Conservation (NYSDEC)
- B. United States Army Corps of Engineers (USCOE)
- C. State and County Department of Transportation (DOT)

1.3 ENVIRONMENTAL REQUIREMENTS

- A. Protection of waterways, streams, wetlands, etc. regulated by the USCOE and NYSDEC.
- B. State, county, or local regulations that govern.

1.4 PRE-CONSTRUCTION REQUIREMENT. The Contractor shall video the entire project site and all areas that will require restoration and supply the Owner's Representative with a copy of the video on a DVD.

PART 2 - PRODUCTS

- 2.1 QUALITY CONTROL. The quality of materials and the performance of work used in the restoration shall produce a street surface, sidewalks, curb, gutter, culvert, driveway, lawn or landscaped area equal to or better than the condition of each before the work began. In the event a surface or material requires restoration and the material is not specified under this Contract, the

Contractor shall notify the Owner's Representative and submit to the Owner's Representative his proposed restoration plan. Such restoration shall be subject to the Owner's Representative review.

2.2 TEMPORARY RESURFACING

- A. Temporary resurfacing shall consist of crushed stone at such depth as is necessary to withstand the traffic to which it is subjected. Where concrete pavements are removed, the broken stone shall be surfaced with "cold patch."
- B. For dust protection, the Contractor shall treat all surfaces not covered with cold patch with calcium chloride (liquid or granular) as approved by the Contracting Owner's Representative.

2.3 CONCRETE PAVEMENT AND PAVEMENT BASE. Concrete pavements and concrete bases for asphalt, brick or other pavement surfacing supported by a concrete base shall be replaced with 4000 psi concrete. If the concrete is to be exposed to weather, it shall be made with air entraining cement or with approved additives.

2.4 OTHER TYPES OF PAVEMENTS AND SURFACES. A. All pavement other than brick and concrete, and all gravel, crushed stone and other types of roadway surfaces, shall be replaced with new materials except where, in the opinion of the Owner's Representative, materials salvaged from stone or gravel roadways have been removed, handled, and stored in such a manner that their original quality has been maintained, in which case such salvaged materials may be used to the extent available in the lower portion of the roadway surfaces after proper screening to remove dust and other excess material.

2.5 LAWNS AND LANDSCAPED AREAS

- A. All disturbed lawns shall be replaced with new materials; topsoil (free from weeds, sticks, and stones) and a seed mix consistent with the remaining lawns.
- B. All landscaped areas shall be replaced with new materials except where in the opinion of the Owner's Representative, the materials salvaged from the landscaped areas have been removed, handled, and stored in such a manner that their original quality has been maintained.

2.6 TRAFFIC SIGNS. All damaged traffic signs shall be replaced with new materials as ordered by the Engineer.

2.7 ROADSIDE DITCHES. All disturbed ditches and swales shall be regraded to their original grades. Ditches shall be topsoiled and seeded with new materials; topsoil (free from weeds, sticks, and stones) and a seed mix consistent with the remaining lawns.

PART 3 - EXECUTION

3.1 SCHEDULE OF REPLACEMENT

- A. In general, permanent restoration of street surfaces will not be permitted until one month's time has elapsed after trenches have been completely backfilled as specified. A greater length of time, but not more than nine months may be allowed to elapse before permanent restoration of street

surfaces is undertaken if, in the opinion of the Owner's Representative, such additional time is required for complete shrinkage and settlement of backfill.

- B. If the Contractor is permitted to replace pavement at any time by the Owner's Representative, it shall not relieve the Contractor of the responsibility to make repairs to damage caused by settlement for a period of one year.
- C. A schedule of replacement operations shall be worked out by the Contractor and approved by the Owner's Representative. The program shall be adhered to unless otherwise approved by the Owner's Representative.

3.2 TEMPORARY RESURFACING AND REPAVING

- A. Immediately upon completion of refilling of the trench or excavation, the Contractor shall place a temporary pavement over all disturbed areas of the street, driveways, alleys and other travelled places where the original surface has been disturbed as a result of this project. The temporary pavement shall be of a character satisfactory in all respects and safe for public travel. The surface of the temporary pavement shall conform to the street grades. Mounding up of any material over a trench and covering the same with loose broken stone will not be considered in compliance with the above requirements.
- B. The temporary pavement shall be placed and maintained by the Contractor in a safe and satisfactory condition until such time as the permanent pavement is completed. The Contractor shall immediately remove and restore to a satisfactory condition any and all such pavements as they become unsatisfactory and not in accordance with the terms and intent of the Specifications.

3.3 PREPARATION FOR PERMANENT REPLACEMENT. After due notice and within the time specified, the temporary broken stone or gravel pavement shall be prepared as the base for the permanent pavement. It shall be brought to the required grade and cross section and thoroughly compacted before placing the permanent pavement. Service boxes, manhole frames and covers and similar structures within the area of pavement to be replaced and not conforming to the new work shall be set to established grades.

3.4 PERMANENT REPAVING. The permanent and final paving of all streets, driveways and similar surfaces where pavement has been removed, disturbed, settled or damaged by or on account of the work of the Contract shall be repaired and replaced by the Contractor by a new and similar pavement at such time as directed. The top surface shall conform with the grade of existing adjacent pavement and the entire replacement shall meet the current specifications of New York State Department of Transportation or local governing agency.

3.5 CONCRETE PAVEMENT AND PAVEMENT BASE

- A. Paving slabs or concrete bases shall be constructed to extend one foot beyond each side of the trench and be supported on undisturbed soil except where such extension of the pavement will leave less than two feet of original pavement between the repaired patch and the original edge of the pavement slab or base, at which time, unless otherwise indicated on the Contract Documents, the repair of the pavement slab or base shall be extended to replace the slab up to the original edge of the pavement. Where the edge of the pavement slab or concrete base slab falls within the trench width, the excavation shall be backfilled with lining up to the base of the concrete pavement and completed as shown on the Contract Documents or as directed.

- B. New concrete shall be dowelled into old concrete and shall be reinforced with reinforcement equivalent to that within the old pavement, but not less than 6-inch by 6-inch #9 wire mesh and #5 bars 18-inch on center inserted 6-inches into the existing concrete and 12-inches into the new concrete base.
- 3.6 OTHER TYPES OF PAVEMENT AND SURFACING. All such roadway surfacing shall be replaced at their original thickness at all points and such replacement shall, in all cases, conform in type, kind, and quality to the original when built. Where specifications covering the original construction are available, such specifications will apply to the replacement work. If not, the work shall be done in conformity with the State Highway Standard which conforms the closest to the type of surfacing being replaced as determined by the Owner's Representative.
- 3.7 CONCRETE WALKS
- A. Concrete walks removed in connection with or damaged as a result of construction operations under the Contract shall be replaced with new construction. Such walks shall be constructed on a thoroughly compacted subgrade, shall have a vertical thickness of not less than 4-inches (or the thickness of the replaced walk where greater than 4-inches) shall be constructed with vertical construction joints spaced not more than 25 feet apart, shall be provided with expansion joints spaced not to exceed 50 feet apart and shall be sloped for drainage at right angles to the longitudinal centerline in the amount of approximately 1/8-inch per foot of walk width.
 - B. Walks shall be float finished, edged with an edging tool, and grooved at construction joints and at intermediate intervals not in excess of the width of the walk. The lengths of blocks formed by the grooving tool and distances between construction and expansion joints shall be uniform throughout the length of the walk in any one location. All walks shall be cured as specified for concrete slabs.
- 3.8 CURBS, GUTTERS, AND CULVERTS. The Contractor shall, at his own expense, permanently repair and relay all curbs, gutters, roadway and driveway culverts where the same have been broken, damaged, or disturbed by the Contractor in executing any of the work covered by the Contract or by or on account of said work. The Contractor shall restore the same in a manner, to a condition and with material, either new or old as required, similar and equal to what existed before the start of this project.
- 3.9 LAWNS AND LANDSCAPED AREAS. All lawns and landscaped areas shall be replaced by the Contractor exactly as they were prior to the project. A vigorous growth of grass must be established for all disturbed lawns and approved by the Contracting Officer.
- 3.10 ROADSIDE DITCHES AND SWALES. All roadside ditches and swales shall be regarded and replaced by the Contractor exactly as they were prior to the project. A vigorous growth of grass must be established for all disturbed ditches and swales and approved by the Contracting Officer.
- 3.11 UNDERGROUND FACILITIES. The Contractor shall repair or replace all disturbed underground facilities by methods approved by the Owner's Representative and regulatory agencies.
- 3.12 TRAFFIC SIGNS. The Contractor shall repair or replace all traffic signs disrupted or removed during construction. Methods of installation shall be approved by the Engineer.
- 3.13 MAINTENANCE. The finished pavements, concrete walks, curbs, driveways, gutters, culverts,

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lawns, landscaped areas, and underground utilities shall be maintained in a satisfactory condition for a period of one year from and after completion and acceptance of the Contract by the Owner's Representative.

END OF SECTION 02575

SECTION 02628 – PVC GRAVITY SEWER PIPE

PART 1 - GENERAL

- 1.1 SCOPE. This section covers furnishing polyvinyl chloride (PVC) gravity sewer pipe and fittings, complete with all jointing materials and appurtenances. Ribbed pipe or open profile pipe will not be acceptable.

Pipe trenching, bedding, and backfilling are covered in the Earthwork section.

- 1.2 SUBMITTALS. Drawings and data shall be submitted in accordance with the Submittals section. Drawings and data shall include, but shall not be limited to, the following:

Details of joints.

Gasket material.

Pipe length.

Certification in accordance with ASTM D3034, Section 11; ASTM F679, Section 10; ASTM F1803, Section 12.

- 1.3 DELIVERY, STORAGE AND HANDLING. Shipping, handling and storage shall be in accordance with Specification Section 01612.

Pipe, fittings, and accessories shall be handled in accordance with Chapter 6 of AWWA Manual M23, to ensure installation in sound, undamaged condition. Pipe shall not be stored uncovered in direct sunlight. Plastic pipe shall be shaded if necessary to prevent curvature due to thermal expansion. Damaged pipe and fittings shall be removed from the site.

PART 2 - PRODUCTS

2.1 MATERIALS.

Pipe and Fittings.	
Solid wall 4 through 15 inches	ASTM D3034, SDR 35, Cell Classification 12454.
18 through 60 inches	ASTM F1803, or ASTM F679, Wall T-1, Cell Classification 12454.
Jointing Materials.	
Bell-and-Spigot Joints.	ASTM D3212, integral bell push-on type elastomeric gasket joints.
Gaskets.	ASTM F477, synthetic rubber. Natural rubber will not be acceptable.
Field-Cut Joints and Connections to Other Piping Materials.	Fernco "Flexible Couplings" or Mission "Eastern Standard Band-Seal Couplings" with stainless steel shear rings.

PART 3 - EXECUTION

- 3.1 ALIGNMENT. Piping shall be laid to the lines and grades indicated on the drawings. Batter boards, laser beam equipment, or surveying instruments shall be used to maintain alignment and grade. At least one elevation measurement shall be made on each length of pipe.

If batter boards are used to determine and check pipe subgrades, they shall be erected at intervals of not more than 25 feet. At least three batter boards shall always be maintained in proper position when trench grading is in progress.

If laser beam equipment is used, periodic elevation measurements shall be made with surveying instruments to verify accuracy of grades. If such measurements indicate thermal deflection of the laser beam due to differences between the ground temperature and the air temperature within the pipe, precautions shall be taken to prevent or minimize further thermal deflections.

- 3.2 LAYING PIPE. Pipe shall be protected from lateral displacement by embedment material installed as specified in the Earthwork section. Pipe shall not be laid in water or under unsuitable weather or trench conditions.

Pipe laying shall begin at the lowest elevation with bell ends facing the direction of laying, except when reverse laying is permitted by Engineer.

Foreign material shall be kept out of the pipe during installation. No debris, tools, clothing, or other foreign objects shall be placed in the pipe.

Whenever pipe laying is stopped, the open end of the pipe shall be closed with a tight-fitting end board to keep out soil. The end board shall have perforations near the center to admit water and prevent flotation of the pipe in the event the trench becomes flooded.

- 3.3 JOINTING. All joint preparation and jointing procedures shall comply with the instructions and recommendations of the manufacturer.

- A. Rubber Gasketed Joints. Rubber gaskets shall be positioned on the joint in accordance with the manufacturer's recommendations. Immediately before joints are pushed together, all joint surfaces shall be thoroughly cleaned and coated with the lubricant furnished with the pipe. The gasket shall be lubricated and positioned in the spigot groove so that the gasket is distributed uniformly around the pipe circumference. The position of the rubber gasket shall be checked with a feeler gauge after each joint is completed. If the gasket is not in the proper position, the joint shall be pulled apart, the gasket removed and discarded, and the joint re-assembled using a new, properly lubricated gasket.

Joint lubricant shall be stored in closed containers and shall be kept clean. When installing pipe in cold weather, the joint surfaces and gaskets shall be kept warm and the joint lubricant shall be prevented from freezing.

- 3.4 SERVICE CONNECTIONS. Service connections shall not be installed as vertical risers but shall be laid on a slope not to exceed 2 vertical to 1 horizontal. Each service connection pipe shall have a solid bearing on undisturbed earth.

- 3.5 CONCRETE ENCASEMENT. Concrete encasement shall be installed where indicated on the drawings. A pipe joint shall be provided within 12 inches of each end of the concrete encasement. Concrete and reinforcing steel shall be as specified in the Cast-in-Place Concrete section. All pipe which is to be encased shall be suitably supported and blocked in proper position and shall be anchored against flotation.
- 3.6 ACCEPTANCE TESTS. Each reach of sewer shall meet the requirements of the following acceptance tests. All defects shall be repaired to the satisfaction of Engineer.
- A. Low Pressure Air Testing. Low pressure air testing shall comply with ASTM F1417. The schedule of testing shall be submitted to Engineer prior to starting the tests. The time of conducting the tests shall be acceptable to Engineer.
- The time elapsed for a 1 psi drop in air pressure shall be not less than, nor shall the air loss exceed, the limits set forth in the governing standard.
- If the length of sewer to be tested is fully or partially submerged in groundwater, the test pressure shall be increased if necessary to overcome the actual static pressure exerted by the groundwater. If a test pressure greater than 8 psi results, air testing shall not be used, and exfiltration testing will be required.
- Leaks shall be located by testing short sections of pipe. Leaks shall be repaired and the reach of sewer retested.
- B. Infiltration. If, at any time prior to expiration of the correction period stipulated in the General Conditions, infiltration exceeds 100 gallons per inch of nominal diameter per mile of sewer per day, Contractor shall locate the leaks and make repairs as necessary to control the infiltration.
- C. Deflection. After backfilling is completed, and before acceptance of the work, each reach of PVC and composite sewer pipe shall be checked for excessive deflection by pulling a mandrel through the pipe, or by other methods acceptable to Engineer. Pipe with diametrical deflection exceeding 5 percent of the inside diameter shall be uncovered, and the bedding and backfill replaced to prevent excessive deflection. Repaired pipe shall be retested.
- 3.7 CLEANING. The interior of all pipe and fittings shall be thoroughly cleaned before installation and shall be kept clean until the work has been accepted. All joint contact surfaces shall be kept clean until the joint is completed.

END OF SECTION 02628

SECTION 02650 - PRECAST CONCRETE YARD STRUCTURES

PART 1 - GENERAL

- 1.1 SCOPE. This section covers precast concrete vaults, electrical manholes and handholes, and other yard structures. Precast concrete yard structures shall be constructed complete with covers, fittings, and other appurtenances in accordance with the details indicated herein and on the Drawings, as required for a complete installation.
- 1.2 SUBMITTALS. Drawings and data covering precast concrete sections, castings, inserts, pulling eyes, gaskets, and other appurtenances shall be submitted in accordance with Section 01300, Submittals.

PART 2 - PRODUCTS

2.1 MATERIALS.

Precast Concrete Sections - Precast concrete; ASTM C478 with 6 inches minimum thickness.

Rubber Gaskets - Neoprene 40 plus or minus 5 hardness when measured by ASTM D2240, Type A durometer.

Mastic - Fed Spec SS-S-210; K.T. Snyder "Ram-Nek," Hamilton-Kent "KentSeal No. 2," or Concrete Sealants.

Coal Tar Paint - Kop-Coat "Bitumastic Super Service Black," Tnemec "46-449 Heavy Duty Black," or Ameron.

- 2.2 ALUMINUM ACCESS HATCHES. Hatch leaves shall be 1/4 inch minimum thickness plate material with pattern as indicated on the drawings. Leaves in hatches not subject to vehicular loading shall be designed to withstand a live load of 300 psf or as indicated on the Drawings, with a maximum deflection of 1/150th of the span. Leaves in hatches subject to off-street vehicular loading shall be designed to withstand an AASHTO H-20 wheel loading.

Leaves shall pivot so that the cover does not protrude above the channel frame.

Door and hatch frames shall be provided with anchorage devices into the concrete slab. Where required for drainage, channel frames shall be 1/4 inch thick with a cross sectional area large enough to allow adequate water drainage. A 1-1/2 inch drainage coupling shall be located in the channel frame. The frame shall be designed to empty through the coupling.

Frames shall have a neoprene door cushion. All aluminum surfaces in contact with concrete or mortar shall be given a heavy coat of epoxy enamel unless specified otherwise.

Hatches shall be supplied with lifting operators and hold-open devices. All doors, rated doors, shall automatically lock in the vertical position by means of a hold-open arm with release handle.

A snap lock with a gasketed cover plug and removable turn handle shall be provided. The operators shall provide for smooth, easy and controlled door operation throughout the entire arc of opening and closing. Operation shall not be affected by temperature.

Aluminum access doors and hatches shall be given a mill finish.

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE, AND HANDLING. Delivery of precast structures shall be coordinated with installation. Precast structures shall be unloaded using proper equipment along the line of work, outside trench limits, as near as practicable to the point of final placement. Precast structures shall be stored off the ground on wood blocks, pallets, or other appropriate means in an accessible area for inspection. Precast structures shall be handled carefully and shall not be bumped or dropped. Hooks shall not be permitted to come in contact with joint surfaces. Use of lifting holes will not be permitted.

3.2 INSPECTION. Precast structures shall be inspected by Engineer when delivered. All cracked or visibly defective units will be rejected and shall be removed from the site and replaced at Contractor's expense.

3.3 CONSTRUCTION. Precast concrete yard structures shall be provided at the locations indicated on the Drawings. Structure dimensions shall be as indicated on the Drawings, as specified, or as required for the installation.

Precast sections shall be provided with a rubber or mastic gasket to seal joints between sections. Precast structures shall be watertight.

Precast structures shall be designed for all applicable dead loads, including earth and cover fill for the conditions indicated on the Drawings.

A. Electrical Manholes and Handholes. Precast concrete manholes and handholes for electrical service as detailed on the Drawings.

Electrical manholes and handholes shall be provided with cast iron frames and covers, knockouts in walls sized as required by the connecting conduits or duct banks, pulling eyes in walls opposite each conduit or duct bank entrance, cable and conduit supports, ground cable, sump, and other details as indicated on the Drawings, specified, or required by the NEC.

B. Vaults. Aluminum access hatches, pipe penetrations, sumps, and other details shall be provided as indicated on the Drawings or required for the installation.

3.4 PAINTING. All surfaces of aluminum which will be in contact with concrete, mortar, or dissimilar metals shall be given a heavy coat of coal tar paint.

3.5 INSTALLATION. Install as indicated on the Drawings.

END OF SECTION 02650

SECTION 02704 - PIPELINE PRESSURE AND LEAKAGE TESTING

PART 1 - GENERAL

- 1.1 SCOPE. This section covers field hydrostatic pressure and leakage testing of piping. The term "piping" shall be used in this section to refer to piping systems, pipelines, or sections thereof.

The testing covered in this Specification Section shall apply to the pipeline work specification in the following Specification Sections:

15061 - Ductile Iron Pipe.

Cleaning and disinfection of piping is covered in another section if required.

- 1.2 GENERAL. Unless otherwise specified, testing of piping shall be completed prior to final cleaning and disinfection.

Contractor shall notify local regulatory agencies to determine if any special procedures or permits are required for disposal of water used for pressure and leakage testing and to identify acceptable locations for disposal of the water. All requirements and costs associated with notifications and obtaining any discharge permit or approvals shall be responsibility of Contractor.

Owner's Representative shall be present during testing and shall be notified of the time and place of testing at least 3 days prior to commencement of the work. All work shall be performed to the satisfaction of Owner's Representative.

- A. Testing Schedule and Procedure. A testing schedule and test procedure shall be submitted to Owner's Representative for review and acceptance not less than 21 days prior to commencement of testing. The schedule shall indicate the proposed time and sequence of testing of the piping. The testing procedure shall establish the limits of the piping to be tested, the positions of all valves during testing, the locations of temporary bulkheads, and all procedures to be followed in performing the testing.
- B. Special Testing Requirements. Special testing requirements include the following:

Unless otherwise acceptable to Owner's Representative, the general sequence of work for each pipeline, or valved or bulkheaded section thereof, shall be as follows:

Initial flushing and cleaning of pipeline.

Filling pipeline.

Hydrostatic pressure and leakage testing.

Disinfection. (Potable Water Pipes)

Final cleaning, flushing, and neutralization of heavily chlorinated water. (Potable Water Pipes)

Bacteriological tests. (Potable Water Pipes)

Unless otherwise acceptable, temporary bulkheads shall be provided during testing so that the test pressures are not applied to existing or new valves and hydrants, or to existing water lines, or to any portion of water lines installed under this Contract that have already been put into service.

A temporary pressure gauge shall be installed at each end of the limits of the pipeline to be tested.

The tests shall be conducted before connections are made to existing water lines, or to any portion of water lines installed under this Contract that have already been put into service.

All auxiliary hydrant valves shall be closed during pressure testing so that the test pressure is not applied to the hydrant valves.

Unless otherwise acceptable, upon completion of testing and disinfection, connections made to existing water lines or to any portion that has been put into service of new water lines installed under this Contract, shall be visually inspected for leakage after placing the water line into service and before backfilling the connection.

- C. Water. Water for testing shall be furnished as stipulated in the Temporary Facilities Section 01501. Following completion of testing, the water shall be disposed of in a manner acceptable to Owner's Representative. Unless otherwise permitted, the water shall be kept out of the remainder of the piping.

PART 2 - PRODUCTS

- 2.1 TEST EQUIPMENT. All necessary connections between the piping to be tested and the water source, together with pumping equipment, water meter, pressure gauges, and all other equipment, materials, and facilities required to perform the specified tests, shall be provided. All required flanges, valves, bulkheads, bracing, blocking, and other sectionalizing devices shall also be provided. All temporary sectionalizing devices shall be removed upon completion of testing. Vents shall be provided in test bulkheads where necessary to expel air from the piping to be tested.

Test pressures shall be applied by means of a force pump sized to produce and maintain the required pressure without interruption during the test.

Water meters and pressure gauges shall be accurately calibrated and shall be subject to review and acceptance by Owner's Representative.

Permanent gauge connections shall be installed at each location where test gauges are connected to the piping during the required tests. Drilling and tapping of pipe walls will be permitted. Upon completion of testing, each gauge connection shall be fitted with a removable plug or cap acceptable to Owner's Representative.

PART 3 - EXECUTION

- 3.1 FILLING AND VENTING. Before filling the piping with water, care shall be taken to ensure that all air release valves and other venting devices are properly installed and in the open position. Hand-operated vent valves shall not be closed until an uninterrupted stream of water is flowing from each valve. The rate of filling the piping with water must not exceed the venting capacity of the installed air vent valves and devices.
- 3.2 BLOCKING AND BACKFILLING. Piping shall be adequately blocked, anchored, and supported before the test pressure is applied.
- 3.3 PRESSURE TESTING. After the piping to be tested has been filled with water, the test pressure shall be applied and maintained without interruption within plus or minus 5 psi of test pressure for 2 hours plus any additional time required for Owner's Representative to examine all piping being tested and for Contractor to locate any defective joints and pipe materials. The test pressure shall be in accordance with Schedule 02704-S01 at the end of this Section.
- 3.4 PIPING LEAKAGE. All piping shall be watertight and free from leaks. Each leak which is discovered within the correction period stipulated in the General Conditions shall be repaired by and at the expense of Contractor.
- 3.5 PIPELINE LEAKAGE TESTING. Following completion of pressure testing and acceptance by Owner's Representative, the pipeline piping shall be subjected to a leakage test. The duration of the leakage test shall be 2 hours plus the additional time required for Owner's Representative to make an accurate determination of leakage.
 - A. Leakage Test Pressure. The hydrostatic pressure maintained during the leakage test shall be at least 75 percent, but not more than 100 percent, of the pressure specified for pressure testing of the piping and shall be maintained within plus or minus 5 psi during the entire time that leakage measurements are being performed.
 - B. Leakage Measurement. Measurement of leakage shall not be attempted until all trapped air has been vented and a constant test pressure has been established. After the pressure has stabilized, piping leakage shall be measured with a suitable water meter installed in the pressure piping on the discharge side of the force pump.
 - C. Allowable Leakage. The term "leakage", as used herein, refers to the total amount of water which must be introduced into the piping during the leakage test to maintain the test pressure.

For above ground piping, no piping will be accepted if it exhibits visible leakage.

For below ground piping, no piping will be accepted if and while it exhibits a leakage rate in excess of that determined by the indicated formulas:

$Q = 0.0075 \text{ DLN (using inch-pound units)}$

Where

$Q = \text{allowable leakage in gallons per hour}$

D = nominal diameter of pipe in inches

L = length of section tested in thousand feet

N = square root of average test pressure in pounds per square inch

Whenever the piping to be tested contains pipe of different diameters, the allowable leakage shall be calculated separately for each diameter and the corresponding length of piping. The resulting allowable leakage rates shall be added to obtain the total allowable leakage for the entire piping.

All joints in piping shall be watertight and free from visible leaks during the leakage test. Each leak which is discovered within the correction period stipulated in the General Conditions shall be repaired by and at the expense of Contractor regardless of the amount that the total leakage may have been below the specified allowable leakage rate during the leakage test.

If the leakage test indicates a higher than allowable leakage rate, Contractor shall locate and repair leaking joints and other defective work to the extent necessary to reduce the leakage to an acceptable value.

3.5 VACUUM SEWER TESTING. A two (2) hour vacuum tightness test of all vacuum sewer mains and lateral connections shall be conducted as follows:

- A. Plug all open connection.
- B. Apply a vacuum to 22 inches of mercury to the pipes and allow the pressure to stabilize for 15 minutes.
- C. There shall be no loss of vacuum in excess of 0.44 inches of mercury vacuum during the two hour test period.
- D. There shall be no water allowed to be admitted into the piping network during this test.

Schedule 02704-S01

Pipeline Designation	Test Pressure (psig)
Potable Water (PW)	150
Raw Sewage (RS)	100

END OF SECTION 02704

SECTION 02925 - TOPSOIL AND GROUNDCOVER

PART 1 - GENERAL

1.1 WORK INCLUDED

Furnishing and installing:

1. Topsoil
2. Fertilizing
3. Seeding
4. Mulching

1.2 REFERENCE

New York Guidelines for Urban Erosion and Sediment Control

PART 2 - PRODUCTS

2.1 Topsoil

Topsoil salvaged from the site or supplied from areas off the site shall be free from stones, trash, roots, noxious weeds (such as nutsedge and quackgrass), sticks, and other foreign substances. Such topsoil shall have at least 2% by weight of fine-textured stable organic material and no greater than 6%. Mucksoil shall not be considered topsoil. Topsoil shall have not less than 20% fine-textured material (passing the No. 200 sieve) and not more than 15% clay. The pH of the material shall be between 6.0 and 7.0. The above parameters of the soil shall be tested and verified by a certified lab prior to acceptance of the topsoil material by the Owner's representative.

2.2 Fertilizer

Fertilizer shall be commercial 5-10-10 or equivalent analysis, containing at least 5% nitrogen, 10% available phosphorous, and 10% potash. Commercial fertilizer shall be delivered in the original bags of the manufacturer, showing weight, analysis, and the name of the manufacturer.

2.3 Seeding

Grass seed shall be a mixture of the species and/or varieties specified, mixed in the proportions specified. The seed shall be fresh and of the latest crop year. Each type of grass in the mixture shall meet or exceed the minimum percentage purity listed for that type of grass. The balance of material in an acceptable seed mixture, other than specified pure live seed shall, for the most part, consist of; non-viable seed, chaff, hulls, live seeds of crop plants, and harmless inert matter. The percentage of weed seed shall not exceed 1% by weight for the mixture. All seed mixtures furnished under this Item shall be mixed by the vendor and shall be delivered in standard sized bags

of the vendor, showing the weight, analysis, and vendor's name. All seed shall be properly stored by the Contractor at the work site and any seed damaged during storage shall be replaced.

SEEDING INFORMATION FOR CRITICAL AND NON-CRITICAL AREAS:

A. Seeding for Critical Areas

1. Temporary seeding
 - a. If seeding in spring, summer, or early fall: Ryegrass (annual or perennial) @ 30lbs./acre - OR
 - b. If seeding in fall or winter: Certified Aroostook winter rye (cereal rye) @ 100 lbs./acre
2. Permanent seeding
 - a. Rough or occasionally mowed areas
 - (1) Empire Birdsfoot Trefoil or Common White Clover @ 8lbs./acre PLUS
 - (2) Tall Fescue @ 20 lbs./acre PLUS
 - (3) Red top @ 2 lbs./acre or Rye Grass perennial @ 5 lbs./acre
 - b. For frequently mowed areas see non-critical areas (permanent seeding).

B. Seeding for Non-Critical Areas

1. Temporary seeding - See temporary seeding for critical areas
2. Permanent seeding - (based on site use)

Seed Mixtures per Site Use:

<u>Species (percent by weight)</u>	<u>lbs./acre</u>
1. Sunny sites (well, moderately well and somewhat poorly drained soils)	
a. General recreation areas and lawns (Medium to High maintenance)	
65% Kentucky bluegrass blend	85-114
20% perennial ryegrass	26-35
15% fine fescue	<u>19-26</u>
	Total - 130-175

2. Shady wet sites (somewhat poor to poorly drained soils)

70% rough bluegrass 60-91

30% blend of shade-tolerant Kentucky bluegrass 25-39

Total - 85-130

2.4 Mulching

Straw mulch shall be free of noxious weeds and coarse materials.

PART 3 - EXECUTION

3.1 Topsoil

Prior to placing topsoil and finalizing the subgrade, scarify all compact, slowly permeable, medium, and fine-textured subsoil areas. Scarify at approximately right angles to the slope direction in soil areas that are steeper than 5%. After the subgrade has been fine-graded to the satisfaction of the Owner's representative, topsoil shall be spread over the area to be seeded to a uniform depth and density. The soil shall be uniformly compacted by a light hand roller to a depth not less than 4-inches unless other depths are shown on the plans. The topsoil shall be placed in dry weather and on dry unfrozen subgrade. Any stones, litter, or objectionable material shall be removed from the topsoil and the surface raked to true lines. When finished, the surface shall conform to the finished grade shown or required and shall have a smooth pulverized surface at the time of seeding. Any irregularities shall be corrected before the fertilizer and seed are placed. Any uneven or settled spots shall be restored to the established lines and grades at the Contractor's own expense. The Contractor shall obtain written approval and acceptance from the Owner's representative prior to any seeding, fertilizing, or mulching.

3.2 Fertilizing

Fertilizer shall be uniformly spread at a rate of 600 lbs./acre for critical areas and 850 lbs./acre for non-critical areas. The fertilizer shall be worked into the top 2-inches of the soil immediately after spreading. The Contractor shall also be responsible for the testing of the existing soil for proper pH range prior to seeding. If the tested soil shows pH out of the range as indicated in Section 2.01 - Topsoil, the Contractor shall spread lime at a rate to bring the soils pH within the acceptable range.

3.3 Seeding

The planting season is usually in the Fall and Spring between August 15 to September 15 and April 1 to May 15. If seeding is done between May 15 - August 15, it must be approved by the Owner's representative. It will be the Contractor's responsibility to keep seeded areas properly watered with a fine spray to insure seed growth.

The seed mixture shall be sown by hand or spread with mechanical spreaders at a rate as specified in Section 2.03 - Seeding. The seed shall be lightly raked into the surface and rolled with a light

hand roller weighing no more than 100 lbs. per foot of width. Seeded areas that are watered with a fine spray shall be done in such a manner so not to wash out the seed. Seeding shall be done on a still day with wind velocities less than five miles per hour.

The Contractor may substitute a hydro-seeding process for hand or mechanical seeding as specified above. Where hydro-seeding is used, the Contractor shall mix water, seed, fertilizer, mulch, and mulch anchorage at rates and materials equal to that specified in Sections 2.02 - Fertilizers, 2.03 - Seeding, 2.04 - Mulching, 3.02 - Fertilizing, 3.03 - Seeding, and 3.04 - Mulching. No truck-mounted spraying equipment shall be driven over the areas to be seeded. The seeded slurry shall be applied in two directions to ensure complete coverage.

3.4 Mulching

Within 24 hours of seeding, mulch shall be applied covering all seeded areas with a uniform blanket at a rate of 2 tons/acre. Mulch shall be applied by hand or with a mechanical spreader after seeded areas have been rolled and watered. If required by the Owner's representative, mulch shall be anchored with wood fiber mulch (hydro mulch) at a rate between 500-750 lbs./acre. The wood fiber mulch must be applied through a hydro-seeder immediately after mulching. If mulch anchorage is provided ready-mixed with the mulch for hydro-seeding operations, no additional mulch anchorage will be required. It shall be the Contractor's responsibility to add or remove mulch to encourage grass growth.

3.5 Maintenance and Protection

The Contractor shall maintain and protect all seeded portions of the Contract until final acceptance by the Owner's representative. Final acceptance will not be made until an acceptable, uniform, vigorous grass growth is obtained in newly seeded areas. Any portion of the seeded areas which are unacceptable and which fail to show a uniform stand of grass from any cause, shall be reseeded as before except the fertilizer shall be applied at one-half the original rate. The bare areas shall be reseeded until they are satisfactorily covered with grass. This will be at the Contractor's own expense. Before final acceptance, the Contractor shall cut all grass from the seeded portions of this Contract a minimum of three times. Upon final acceptance of a seeded area by the Owner's representative, the Owner will be responsible for maintenance and protection of that area. The Contractor shall be responsible for cleaning up all debris, protective materials, excess mulch, etc. prior to final acceptance. Final acceptance of any work shall be made by the Owner's representative.

END OF SECTION 02925

SECTION 02960 - TEMPORARY BYPASS PUMPING SYSTEMS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The work covered by this section consists of providing all temporary bypassing to perform all operations in connection with the flow of storm water around pipe segment(s) or structures. The Contractor shall maintain storm water flow in the construction area in order to prevent backup and/or overflow and provide reliable storm water flow at all times.

1.2 REQUIREMENTS

- A. Provide all services related to, but not limited to, mobilization, setup, around the clock operations and maintenance, demobilization, traffic control, and all other materials, labor and equipment to install, maintain, and operate a complete continuous pumping and transport system of storm water for 24 hours per day, 7 days per week, until the portion(s) of the work have been completed to the satisfaction of the Owner's Representative.
- B. The means and methods of accomplishing and maintaining the temporary bypass pumping and associated facilities is the sole responsibility of the Contractor.
- C. The temporary bypass pumping system shall be installed as a complete stand-alone system. Provide all fuel, pumps, controls, piping and accessories for operation of the system.
- D. The temporary bypass pumping shall be continuously monitored.
- E. The Contractor shall be responsible for bypassing storm water in a way that assures that no storm water is allowed to leak outside of the project site or the bypass pipelines. Bypass pumping shall be done in such a manner as not to damage private or public property, or create a nuisance or public menace.

The pumped storm water shall be in an enclosed pipe that is adequately protected from traffic, and shall be redirected into downstream storm sewer system.

- F. No bypassing to the ground surface, receiving waters, storm drains, or bypassing which results in soil or groundwater contamination or any potential health hazards shall be permitted.
- G. The Contractor shall be liable for all cleanup, damages, and resultant fines in the event of spills, leaks or backups associated with bypass pumping activities, which includes commissioning, operation, and decommissioning of bypass pumping facilities.
- H. No interruption of storm water flow shall be permitted throughout the duration of the project. Contractor is responsible for all storm sewer overflows during construction of this work and bypass operations.
- I. Coordinate the locations and alignment of the bypass piping and pumping equipment with the Owner's Representative.

- J. Where bypass pipelines are required to cross traffic lanes, and will be in place for more than 3 days, the piping and fittings shall be buried a minimum of 4 inches below the pavement surface and backfilled with temporary asphalt concrete surfacing or use an approved flow through drivable apparatus approved by Owner's Representative. At no time shall traffic lanes be blocked or closed, unless specifically allowed in writing by the Owner's Representative.
- 1.3 SUBMITTALS. Detailed plan and description of proposed pumping system. Indicate number, size, material, location and method of installation of suction and discharge piping, size of pipeline or conveyance system to be bypassed, staging area for pumps, site access point, and expected flow.
- Size and location of manhole or access points for suction and discharge hose or piping.
- Sections showing suction and discharge pipe depth, embedment, select fill and special backfill, if buried.
- Temporary pipe supports and anchoring required.
- Sewer / tank plugging method and type of plugs.
- Bypass pump sizes, capacity, number of each size to be on site and power requirements.
- Backup pump, power and piping equipment.
- Calculations of static lift, friction losses, and flow velocity. Pump curves showing pump operating range.
- Design plans and computation for access to bypass pumping locations.
- Calculations for selection of bypass pumping pipe size.
- Method of noise control for each pump and / or generator.
- Method of protecting discharge manholes or structures from erosion and damage.
- Schedule for installation and maintenance of bypass pumping lines.
- Procedures to monitor upstream mains for backup impacts.
- Procedures for setup and breakdown of pumping operations.
- Emergency plan detailing procedures to be followed in event of pump failures.
- Maintain copy of emergency plan on site for duration of project.
- 1.4 CONTRACTORS RESPONSIBILITY FOR OVERFLOWS AND SPILLS
- A. Schedule and perform work in manner that does not cause or contribute to incidence of overflows, releases or spills of storm water from storm sewer system or bypass operation.

1.5 DELIVERY AND STORAGE

- A. Transport, deliver, handle, and store pipe, fittings, pumps, ancillary equipment and materials to prevent damage and following manufacturer's recommendations. Inspect all material and equipment for proper operation before initiating work.
- B. Material found to be defective or damaged due to manufacturer or shipment.
 - 1. When Engineer deems repairable. Repair as recommended by manufacturer.
 - 2. When Engineer deems not repairable. Replace as directed by Engineer before initiating work.
 - 3. Repair or replacement of defective or damaged material and equipment will be at no cost to Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Polyethylene Plastic Pipe.
 - 1. High density solid wall and following ASTM F714 Polyethylene (PE) Plastic Pipe (SDR-DR) based on Outside Diameter, ASTM D1248 and ASTM D3550 2. Homogenous throughout, free of visible cracks, discoloration, pitting, varying wall thickness, holes, foreign material, blisters, or other deleterious faults.
 - 2. Homogenous throughout, free of visible cracks, discoloration, pitting, varying wall thickness, holes, foreign material, blisters, or other deleterious faults.

Defective areas of pipe: Cut out and joint fused as stated herein.
 - 3. Assembled and joined at site using couplings, flanges or butt-fusion method to provide leak proof joint. Follow manufacturer's instructions and ASTM D 2657.

Threaded or solvent joints and connections are not permitted.
 - 4. Fusing. By personnel certified as fusion technicians by manufacturer of HDPE pipe and/or fusing equipment.
 - 5. Butt-fused joint. True alignment and uniform roll-back beads resulting from use of proper temperature and pressure.

Allow adequate cooling time before removal of pressure.

Watertight and have tensile strength equal to that of pipe.
- B. Flexible Hoses and Associated Couplings and Connectors.

1. Abrasion resistant.
 2. Suitable for intended service.
 3. Rated for external and internal loads anticipated, including test pressure.

External loading design. Incorporate anticipated traffic loadings, including traffic impact loading.
 4. When subject to traffic loading, compose system, such as traffic ramps or covers.
- C. Valves and Fittings. Determined according to flow calculations, pump sizes previously determined, and system operating pressures.
- D. Plugs. Selected and installed according to size of line to be plugged, pipe and manhole configurations, and based on specific site.
1. Pipe diameters 18 inches and smaller shall use mechanical plugs with EPDM gaskets.
 2. Pipe diameters larger than 18 inches shall use inflatable bag stoppers with 2 or more pieces.
 3. Additional plugs. Available in the event a plug fails. Plugs will be inspected before use for defects which may lead to failure.
- E. Aluminum “irrigation type” piping or glued PVC piping will not be permitted.

2.2 EQUIPMENT

- A. Pumps.
1. A minimum of 2 pumps shall be provided.
 2. Pump capacity shall be sufficient to pump the design peak flow with the largest pump out of service.
 3. Pumps shall be a packaged unit with a skid base or 2-wheel trailer.
 4. Pumps shall be fully automatic, self-priming, close-coupled centrifugal units that do not require use of foot valves for priming.
 5. Pumps shall utilize oil-lubricated mechanical seal.
 6. Pumps shall be capable of passing 3-inch diameter solids, rags, rocks, hair and other debris encountered in municipal storm water.
 7. Pumps shall be operated by diesel engine and include the following:

Minimum 24-hour capacity diesel fuel tank as defined by fuel consumption during peak pumping rate.

Fuel gauge with red warning light when tank approaches empty.

8. Pumps shall be capable of dry operation for up to 5 hours to accommodate large fluctuations in flow.
9. The system shall include the following features:

START/STOP operation.

Instrumentation, switches and controls for automatic operation and monitoring for each pump.

2.3 DESIGN REQUIREMENTS

- A. Bypass pumping systems.
 1. Sufficient capacity to pump peak flow of 10,500 gpm.
 2. Operate 24 hours per day.
- B. Provide pipeline plugs and pumps of adequate size to handle peak flow, and temporary discharge piping to ensure total flow of main can be safely diverted around section to be repaired.
- C. Pump equipment shall be equipped with devices or enclosures for noise attenuation.
- D. The noise level shall be at or below 70 dBA at a distance of 25 feet from the pumping equipment.

PART 3 - EXECUTION

3.1 GENERAL

- A. The Contractor shall notify the Owner's Representative a minimum of 30 days prior to the WORK requiring temporary bypass pumping and notify the Owner's Representative at least 48 hours prior to bypassing or diverting flow.
- B. All pumps, generators, and other equipment shall be placed on a plastic tarp to protect against spills of petroleum products used by the equipment.
- C. Before taking the existing facility out of service, Contractor shall verify that bypass system is fully operational.
- D. Provisions and requirements must be reviewed by Engineer before starting construction.
- E. Remove manhole sections or make connections to existing sewer and construct temporary bypass pumping structures at access location indicated on Drawings and as required to provide adequate suction conduit.
- F. Plugging or blocking of storm flows shall incorporate a primary and secondary plugging device. When plugging or blocking is no longer needed for performance and acceptance of work, remove in a manner that permits the storm flow to slowly return to normal without surge, to prevent surcharging or causing other major disturbances downstream.

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- G. When working inside manhole or force main, exercise caution. Follow OSHA, Local, State and Federal requirements.
- H. Installation of Bypass Pipelines. When roadway ramps cannot be used, place bypass in trenches and cover with temporary pavement as approved by Engineer.
- I. During bypass pumping operation, protect sewer lines from damage inflicted by equipment.
- J. Upon completion of bypass pumping operations remove piping.

END OF SECTION 02960

ITEM 627.0003 25**CONCRETE****1. DESCRIPTION:**

- 1.01 Furnish all labor, materials, equipment and services necessary to complete the work as indicated on the Contract Plans and the attached Specification Summary.
- 1.02 All work shall conform to the requirements specified in Part 1 – General, of the Sections listed.

2. MATERIALS:

- 2.01 The materials shall be as specified in Part 2 – Products, of the Sections listed.

3. CONSTRUCTION DETAILS:

- 3.01 The construction details shall be as specified on Part 3 – Execution, if the Sections listed.

4. METHOD OF MEASUREMENT:

- 4.01 This item shall be measured for payment on a lump sum basis for the work completed in accordance with the Contract Documents and as directed by the Engineer.

5. BASIS OF PAYMENT:

- 5.01 Payment for this item shall be made at the lump sum bid price bid. The lump sum price bid shall include cost of furnishing all labor, material, equipment and appliances necessary to complete the work as indicated on the Contract Plans and as specified herein in the Sections listed.
- 5.02 Detailed Estimate:
 - A. Before the first certificate of payment is issued for the work under this item, submit a detailed estimate of quantities and prices for all materials, labor, and other items included under this item, which shall aggregate the contract lump sum price bid for this item. Prepare the detailed estimate in the same sequence as the Sections listed.
 - B. The detailed estimate shall be supported by such evidence, including certified copies of subcontracts, as the Engineer may require.
 - C. The detailed estimate must be approved by the Engineer who may revise it as, in his/her reasonable judgment, is necessary to make the various item conform to their true values. The value of each certificate of payment will be based on the approved detailed estimate.
- 5.03 Monthly payments will be made for this item in proportion to the total amount of work completed.

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CONCRETE

1. SPECIFICATION SUMMARY

1.01 This Item includes the following specifications:

- A. Section 03300 Cast-In-Place Concrete
- B. Section 03600 Grout

1.02 This item shall include, but not be limited to, the following:

- A. All preparatory and other such work related to the construction and implementation of concrete forms and products.

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes. B. Related Requirements:
 - 1. Section 312000 "Earth Moving" for drainage fill under slabs-on-grade.
 - 2. Section 014100 "Special Inspection and Testing"

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete Subcontractor.
 - e. Special concrete finish Subcontractor.
 - 2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, methods for achieving specified floor and slab

flatness and levelness, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - 1. Location of construction joints is subject to approval of the Architect.
- E. Samples: For waterstops.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
 - 5. Waterstops.
 - 6. Curing compounds.
 - 7. Floor and slab treatments.
 - 8. Bonding agents.
 - 9. Adhesives.
 - 10. Vapor retarders.
 - 11. Semirigid joint filler.
 - 12. Joint-filler strips.
 - 13. Repair materials.
- C. Material Test Reports: For the following, from a qualified testing agency:

1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
 - D. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
 - E. Field quality-control reports.
 - F. Minutes of preinstallation conference.
- 1.7 QUALITY ASSURANCE
- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
 - B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- 1.8 PRECONSTRUCTION TESTING
- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures or provide six months use record and concrete break results.
- 1.9 DELIVERY, STORAGE, AND HANDLING
- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
 - B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.
- 1.10 FIELD CONDITIONS
- A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301 (ACI 301M).
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
 4. Place high low remote reporting thermometers in corners and middle below curing blanket material at least 4 locations, to document that curing temperatures have been maintained.
- B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and ACI 305.1 (ACI 305.1M), and as follows:
1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.
 3. Place high low remote reporting thermometers in corners and middle below curing blanket material at least 4 locations, to document that curing temperatures have been maintained.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301 (ACI 301M).
 2. ACI 117 (ACI 117M).

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
1. Plywood, metal, or other approved panel materials.
 2. Exterior-grade faced plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces with gradual or abrupt irregularities not exceeding

specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

- D. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.
- E. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.
- F. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- G. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- B. Deformed-Steel Wire: ASTM A 1064/A 1064M.
- C. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as drawn steel wire into flat sheets.
- D. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.

2.4 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.5 CONCRETE MATERIALS

A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: ASTM C 150/C 150M, Type I/II, gray.
2. Portland Limestone Cement: ASTM C 595/C 595M, Type IL, gray.
3. Fly Ash: ASTM C 618, Class F. With reactivity record less than 4 months old.
4. Slag Cement: ASTM C 989/C 989M, Grade 120.

D. Normal-Weight Aggregates: ASTM C 33/C 33M, aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar concrete applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 1 inch (25 mm) nominal free of materials with deleterious reactivity to alkali in cement.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

E. Air-Entraining Admixture: ASTM C 260/C 260M.

F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture (WRA): ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture (HRWRA): ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

G. Water: ASTM C 94/C 94M potable

2.6 WATERSTOPS

A. Flexible Rubber Waterstops: CE CRD-C 513, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BoMetals, Inc.

- b. Greenstreak.
 - c. Paul Murphy Plastics Company.
 - 2. Profile: Ribbed with center bulb.
 - 3. Dimensions: 4 inches by 1/4 inch thick (100 mm by 4.75 mm thick); nontapered.
- B. Chemically Resistant Flexible Waterstops: Thermoplastic elastomer rubber waterstops, for embedding in concrete to prevent passage of fluids through joints; resistant to oils, solvents, and chemicals. Factory fabricate corners, intersections, and directional changes.
- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BoMetals, Inc.
 - b. Greenstreak.
 - c. Paul Murphy Plastics Company.
 - 2. Profile: Ribbed with center bulb.
 - 3. Dimensions: 4 inches by 1/4 inch thick (100 mm by 4.75 mm thick); nontapered.

2.7 VAPOR RETARDERS

- C. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.
- 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Vialflex Vaporblock 10 Garage Basis of design/Vaporblock 15 Office Basis of design
 - b. Henry Company; Moistop Ultra 10 / 15.
 - c. Meadows, W. R., Inc.; Perminator 10 mil / 15 mil.
 - d. Stego Industries, LLC; Stego Wrap Class A Vapor Retarder 10 mil / 15 mil

2.8 LIQUID FLOOR TREATMENTS

- D. VOC Content: Liquid floor treatments shall have a VOC content compliant with standard NYS regulations for architectural and industrial maintenance coatings.
- A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.
- 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ChemMasters; Chemisil Plus.
 - b. ChemTec Int'l; ChemTec One.
 - c. Curecrete Distribution Inc.; Ashford Formula.
 - d. Dayton Superior Corporation; Day-Chem Sure Hard (J-17).

- e. Euclid Chemical Company (The), an RPM company; Euco Diamond Hard.
- f. Meadows, W. R., Inc.; LIQUI-HARD.
- g. Metalcrete Industries; Floorsaver.
- h. Nox-Crete Products Group; Duro-Nox.
- i. Symons by Dayton Superior; Buff Hard.

2.9 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, nondissipating certified by curing compound manufacturer not to interfere with floor and slab treatments (dry shake and/or penetrating liquid) and may not interfere with flooring applications in office. Euclid Chemical Company Kurez KR Vox basis of design or approved equal.

2.10 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 according to ASTM D 2240.
- C. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch (0.85 mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.10 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch (6.4 mm) and that can be filled in over a scarified surface to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.
 - 4. Compressive Strength: Not less than 5000 psi (34.5 MPa) at 28 days when tested according to ASTM C 109/C 109M.

2.11 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301 (ACI 301M).
 - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - 2. Fly Ash: 20 percent.
 - 3. Combined Fly Ash and Pozzolan: 25 percent.
 - 4. Slag Cement: 25 percent.
 - 5. Combined cementitious not exceeding 50 percent with all limits above met
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 - 2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, concrete on which finished flooring will be applied/installed, and concrete with a w/c ratio below 0.50.

2.12 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings, Foundation Walls, Peirs and Exterior Slabs and Pads: Normal-weight concrete.

1. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
2. Maximum W/C Ratio: 0.45
3. Slump Limit: 4 inches (100 mm, plus or minus 1 inch (25 mm) w/o WRA or HRWRA
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch (38-mm) nominal maximum aggregate size.

B. Interior Slabs-on-Grade: Normal-weight concrete, Trowel Finished w/ Liquid Floor Treatment

1. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
2. Maximum W/C Ratio: 0.45
3. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm). w/o WRA or HRWRA
4. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.13 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.14 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes unless mixing temperature control can be maintained and proven compliant in accordance with ACI 305.
2. All trucks that exceed above timeframes shall have a slump test recorded from mid batch for reference.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301 (ACI 301M), to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 (ACI 117M).
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORING AND RESHORING INSTALLATION

- A. Comply with ACI 318 (ACI 318M) and ACI 301 (ACI 301M) for design, installation, and removal of shoring and reshoring.
 - 1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
- C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.7 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
3. Locate joints for slabs in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls at underside of floors and slabs and at the top of footings or floor slabs.
5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 WATERSTOP INSTALLATION

- A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

3.9 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Engineer.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M).
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301 (ACI 301M).
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.10 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces exposed to public view, to be covered with a coating or covering material applied directly to concrete.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.11 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces to receive trowel finish
- C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces exposed to view including interior slabs on grade
 - 2. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
 - b. Elevated Slabs: F(F) = 20
- D. Trowel and Fine-Broom Finish for exterior concrete work: Apply a first trowel finish to surfaces. While concrete is still plastic, slightly scarify surface with a fine broom. This applies to for the bottom of the pit base slab, , and exterior equipment foundations (tops)

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, walks, and elsewhere as indicated.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.12 MISCELLANEOUS CONCRETE ITEM INSTALLATION

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Equipment Bases and Foundations:
1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 2. Construct concrete bases 4 inches (100 mm) high unless otherwise indicated, and extend base not less than 6 inches (150 mm) in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
 3. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
 6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.
 8. Broom finish top surfaces of exterior pads around trowel smooth areas at equipment bearing points.

3.13 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305.1 (ACI 305.1M) for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods. Slab on grade shall be moisture cured by either item 1 or 2 below:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.
 - 3. Curing Compound (**Only with Engineer's Approval**): Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.
 - 4. Curing and Sealing Compound (**only with Engineer's Approval**): Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.14 LIQUID FLOOR TREATMENT APPLICATION

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
 - 1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
 - 2. Do not apply to concrete that is less than seven days' old.
 - 3. Prepare and apply materials in accordance with manufacturer's instructions

3.15 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 - 1. Defer joint filling until concrete has aged at least one month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.16 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete. Limit cut depth to 3/4 inch (19 mm). Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Engineer.

- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 - 2. After concrete has cured at least 14 days, correct high areas by grinding.
 - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 - 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 - 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 - 6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 - 7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Engineer's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Engineer's approval.

3.17 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

1. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 2. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
 3. Deficient work that cannot be repaired to a standard matching the specified finish or geometry may require removal and replacement at the contractor's expense.
- D. Measure floor and slab flatness and levelness according to ASTM E 1155 (ASTM E 1155M) within 48 hours of finishing.

3.18 PROTECTION OF LIQUID FLOOR TREATMENTS

- A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 033000

SECTION 03600 -GROUT

PART 1 - GENERAL

- 1.1 SCOPE. This section covers procurement and installation of grout. Unless otherwise specified, only non-shrink grout shall be furnished.
- Epoxy grouting of anchor bolts, threaded rod anchors, and reinforcing bars is covered in the anchorage in concrete and masonry section. Grouting of masonry is covered in the building masonry section.
- 1.2 SUBMITTALS. A letter of certification indicating the types of grout to be supplied and the intended use of each type shall be submitted in accordance with the submittals section.
- 1.3 DELIVERY, STORAGE, AND HANDLING. Materials shall be handled, transported, and delivered in a manner that will prevent damage of any kind. Materials shall be protected from moisture.

PART 2 - PRODUCTS

- 2.1 MATERIALS.
- Nonshrink Grout - Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
- Water - Clean and free from deleterious substances.
- 2.2 NONSHRINK GROUT. Nonshrink grout shall be furnished factory premixed so that only water is added at the jobsite.

PART 3 - EXECUTION

- 3.1 PREPARATION. The concrete foundation to receive nonshrink grout shall be saturated with water for at least 12 hours preceding grouting unless additional time is required by the grout manufacturer.
- 3.2 INSTALLATION.
- A. Mixing. Grout shall be mixed in a mechanical mixer. No more water shall be used than is necessary to produce a flowable grout.
- B. Placement. Unless otherwise specified or indicated on the drawings, grout under baseplates shall be 1-1/2 inches thick. Grout shall be placed in strict accordance with the directions of the manufacturer so that all spaces and cavities below the baseplates are completely filled without

voids. Forms shall be provided where structural components of baseplates will not confine the grout.

- C. Edge Finishing. In all locations where the edge of the grout will be exposed to view, the grout shall be finished smooth after it has reached its initial set. Except where shown to be finished on a slope, the edges of grout shall be cut off flush at the baseplate.
- D. Curing. Nonshrink grout shall be protected against rapid loss of moisture by covering with wet clothes or polyethylene sheets. After edge finishing is completed, the grout shall be wet cured for at least 3 days and then an acceptable membrane curing compound shall be applied.

END OF SECTION 03600

NEW YORK STATE THRUWAY AUTHORITY
NIAGARA PUMP HOUSE UPGRADE

C&S #185.026.004

ITEM 627.0005 25**METALS****1. DESCRIPTION:**

- 1.01 Furnish all labor, materials, equipment and services necessary to complete the work as indicated on the Contract Plans and the attached Specification Summary.
- 1.02 All work shall conform to the requirements specified in Part 1 – General, of the Sections listed.

2. MATERIALS:

- 2.01 The materials shall be as specified in Part 2 – Products, of the Sections listed.

3. CONSTRUCTION DETAILS:

- 3.01 The construction details shall be as specified on Part 3 – Execution, if the Sections listed.

4. METHOD OF MEASUREMENT:

- 4.01 This item shall be measured for payment on a lump sum basis for the work completed in accordance with the Contract Documents and as directed by the Engineer.

5. BASIS OF PAYMENT:

- 5.01 Payment for this item shall be made at the lump sum bid price bid. The lump sum price bid shall include cost of furnishing all labor, material, equipment and appliances necessary to complete the work as indicated on the Contract Plans and as specified herein in the Sections listed.
- 5.02 Detailed Estimate:
 - A. Before the first certificate of payment is issued for the work under this item, submit a detailed estimate of quantities and prices for all materials, labor, and other items included under this item, which shall aggregate the contract lump sum price bid for this item. Prepare the detailed estimate in the same sequence as the Sections listed.
 - B. The detailed estimate shall be supported by such evidence, including certified copies of subcontracts, as the Engineer may require.
 - C. The detailed estimate must be approved by the Engineer who may revise it as, in his/her reasonable judgment, as necessary to make the various items conform to their true values. The value of each certificate of payment will be based on the approved detailed estimate.
- 5.03 Monthly payments will be made for this item in proportion to the total amount of work completed.

NEW YORK STATE THRUWAY AUTHORITY
NIAGARA PUMP HOUSE UPGRADE

C&S #185.026.004

ITEM 627.0005 25

METALS

1. SPECIFICATION SUMMARY

1.01 This Item includes the following specifications:

- A. Section 05120 Structural Steel
- B. Section 05521 Pipe and Tube Railings

1.02 This item shall include, but not be limited to, the following:

- A. Detailing various components of metal fabrications.

SECTION 05120 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural steel.

1.2 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, and other pertinent data.
2. Include embedment drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts.

- C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:

1. Power source (constant current or constant voltage).
2. Electrode manufacturer and trade name, for demand critical welds.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified fabricator.

- B. Welding certificates.

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

- D. Mill test reports for structural steel, including chemical and physical properties.

E. Product Test Reports: For the following:

1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
2. Shop primers.
3. Nonshrink grout.

F. Source quality-control reports.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.
- B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category ACSE.
- C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P1 or SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- E. Comply with applicable provisions of the following specifications and documents:
 1. AISC 303.
 2. AISC 360.
 3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1.7 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992/A 992M.
- B. Channels, Angles-Shapes: ASTM A 36/A 36M.
- C. Plate and Bar: ASTM A 36/A 36M.
- D. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.

2.3 PRIMER

- A. Primer: Provided for reference only should a shop applied compatible primer be used over galvanized surface as a fabricator's elective scratch protection method, all steel is galvanized on this project primer is not required.
 - 1. Should primer be desired fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with galvanizing and any topcoat.

2.4 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.
 - 1. Mark and match-mark materials for field assembly.
 - 2. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- D. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 3, "Power Tool Cleaning."
- E. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.
 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 2. Baseplate Holes: Cut, drill, or punch holes perpendicular to steel surfaces.
 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.5 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.6 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 2. Surfaces to be field welded.
 3. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 1. SSPC-SP 3, "Power Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.7 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.
 - 1. Galvanize embedded steel angles (in concrete) located at exterior door locations.
 - 2. As shown on drawings.

2.8 SOURCE QUALITY CONTROL

- A. Testing Agency: Contractor will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.
 - 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
- C. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - 1. Liquid Penetrant Inspection: ASTM E 165.
 - 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - 3. Ultrasonic Inspection: ASTM E 164.
 - 4. Radiographic Inspection: ASTM E 94.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
 - 1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Base Bearing and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Weld plate washers to top of baseplate.
 - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
- E. Do not use thermal cutting during erection.
- F. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened.

- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.
- B. Bolted Connections: Bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Field welds will be visually inspected according to AWS D1.1/D1.1M.
 - 1. In addition to visual inspection, field welds will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94. Only where specifically requested.
- D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.
- B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

END OF SECTION 05120

SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel railings.

B. Related Requirements:

1.2 COORDINATION

- A. Coordinate galvanizing with topcoats to be applied as needed. Comply with coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Manufacturer's product lines of mechanically connected railings.
2. Fasteners.
3. Post-installed anchors.
4. Handrail brackets.
5. Metal finishes.
6. Paint products.

- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Signed and sealed by a NYS PE.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For delegated design professional engineer.
- B. Welding certificates.
- C. Mill Certificates: Signed by manufacturers of stainless steel products, certifying that products furnished comply with requirements.

- D. Product Test Reports: For tests on railings performed by a qualified testing agency, in accordance with ASTM E894 and ASTM E935.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 - 3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect mechanical finishes on exposed surfaces of railings from damage by applying a strippable, temporary protective covering before shipping.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Railings, including attachment to building construction, withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.. Infill load and other loads need not be assumed to act concurrently.

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as

supported rails unless otherwise indicated.

1. Provide type of bracket with predrilled hole for exposed bolt anchorage and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

2.3 STEEL RAILINGS

- A. Tubing: ASTM A500/A500M (cold formed).
- B. Pipe: ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
 1. Provide galvanized finish for all installations.
- C. Plates, Shapes, and Bars: ASTM A36/A36M.

2.4 FASTENERS

- A. Fastener Materials:
 1. Hot-Dip Galvanized Railing Components: Type 304 stainless steel or hot-dip zinc-coated steel fasteners complying with ASTM A153/A153M or ASTM F2329/F2329M for zinc coating.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:
 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
- D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193.

2.5 MISCELLANEOUS MATERIALS

- A. Handrail Brackets: Galvanized steel center of handrail 2-1/2 inches (63.5 mm) from wall.
- B. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welded.
- C. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint, complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

- E. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

2.6 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.
 - 1. Clearly mark units for reassembly and coordinated installation.
 - 2. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately.
 - 1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
 - 2. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that are exposed to weather in a manner that excludes water.
 - 1. Provide weep holes where water may accumulate.
 - 2. Locate weep holes in inconspicuous locations.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded connections unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove flux immediately.
 - 4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #3 welds; utilitarian appearance not subject to view, partially dressed weld with spatter removed.
- I. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
- J. Form changes in direction as follows:
 - 1. As detailed.
 - 2. By bending.
 - 3. By bending to smallest radius that will not result in distortion of railing member.

- K. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- L. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.
- M. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- N. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
- O. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work.
 - 1. Fabricate anchorage devices capable of withstanding loads imposed by railings.
 - 2. Coordinate anchorage devices with supporting structure.
- P. For removable railing posts, fabricate slip-fit sockets from stainless steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height.
 - 1. Provide socket covers designed and fabricated to resist being dislodged.
 - 2. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.
- Q. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.7 STEEL AND IRON FINISHES

- A. Galvanized Railings:
 - 1. Hot-dip galvanize steel railings, including hardware, after fabrication.
 - 2. Comply with ASTM A123/A123M for hot-dip galvanized railings.
 - 3. Comply with ASTM A153/A153M for hot-dip galvanized hardware.
 - 4. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Perform cutting, drilling, and fitting required for installing railings.
 - 1. Fit exposed connections together to form tight, hairline joints.
 - 2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
 - 3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
 - 4. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 5. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 - 6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
 - 1. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- C. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.2 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article, whether welding is performed in the shop or in the field.

3.3 ANCHORING POSTS

- A. Anchor posts to metal surfaces with flanges, angle type, or floor type, as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For steel railings, weld flanges to post and bolt to metal supporting surfaces.

3.4 ATTACHING RAILINGS

- A. Anchor railing ends to concrete and masonry with flanges connected to railing ends and anchored to wall construction with anchors and bolts.
- B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends or connected to railing ends, using nonwelded connections.

- C. Attach handrails to walls with wall brackets. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface.
 - 1. Use type of bracket with predrilled hole for exposed bolt anchorage.
 - 2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- D. Secure wall brackets and railing end flanges to building construction as follows:
 - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
- E. Install railing gates level, plumb, and secure for full opening without interference.
 - 1. Attach hardware using tamper-resistant or concealed means.
 - 2. Adjust hardware for smooth operation.

3.5 CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A780/A780M.

3.6 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period, so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 055213

ITEM 627.0007 25**THERMAL AND MOISTURE PROTECTION****1. DESCRIPTION:**

- 1.01 Furnish all labor, materials, equipment and services necessary to complete the work as indicated on the Contract Plans and the attached Specification Summary.
- 1.02 All work shall conform to the requirements specified in Part 1 – General, of the Sections listed.

2. MATERIALS:

- 2.01 The materials shall be as specified in Part 2 – Products, of the Sections listed.

3. CONSTRUCTION DETAILS:

- 3.01 The construction details shall be as specified on Part 3 – Execution, if the Sections listed.

4. METHOD OF MEASUREMENT:

- 4.01 This item shall be measured for payment on a lump sum basis for the work completed in accordance with the Contract Documents and as directed by the Engineer.

5. BASIS OF PAYMENT:

- 5.01 Payment for this item shall be made at the lump sum bid price bid. The lump sum price bid shall include cost of furnishing all labor, material, equipment and appliances necessary to complete the work as indicated on the Contract Plans and as specified herein in the Sections listed.
- 5.02 Detailed Estimate:
 - A. Before the first certificate of payment is issued for the work under this item, submit a detailed estimate of quantities and prices for all materials, labor, and other items included under this item, which shall aggregate the contract lump sum price bid for this item. Prepare the detailed estimate in the same sequence as the Sections listed.
 - B. The detailed estimate shall be supported by such evidence, including certified copies of subcontracts, as the Engineer may require.
 - C. The detailed estimate must be approved by the Engineer who may revise it as, in his/her reasonable judgment, is necessary to make the various item conform to their true values. The value of each certificate of payment will be based on the approved detailed estimate.
- 5.03 Monthly payments will be made for this item in proportion to the total amount of work completed.

ITEM 627.0007 25**THERMAL AND MOISTURE PROTECTION****1. SPECIFICATION SUMMARY**

1.01 This Item includes the following specifications:

- A. Section 07162 Crystalline Waterproofing
- B. Section 07900 Caulking

1.02 This item shall include, but not be limited to, the following:

- A. All measures and products needed in order to properly seal the pumphouse from the elements.

SECTION 07162 - CRYSTALLINE WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes crystalline waterproofing for positive and negative-side application to concrete within Tanks and Liquid Containing Structures.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions and installation instructions for crystalline waterproofing.
- B. Qualification Data: For Applicator.
- C. Product Certificates: For waterproofing, patching, and plugging materials, from manufacturer.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for crystalline waterproofing.
- E. Field quality-control reports.

1.3 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm experienced in applying crystalline waterproofing similar in material, design, and extent to that indicated for this Project, whose work has resulted in applications with a record of successful in-service performance, and that employs workers trained and approved by manufacturer.
- B. Preinstallation Conference: Conduct conference at Project site.

1.4 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit crystalline waterproofing to be performed according to manufacturer's written instructions.
- B. Proceed with waterproofing work only after pipe sleeves, vents, curbs, inserts, drains, and other projections through the substrate to be waterproofed have been completed. Proceed only after substrate defects, including honeycombs, voids, and cracks, have been repaired to provide a sound substrate free of forming materials, including reveal inserts.
- C. Ambient Conditions: Proceed with waterproofing work only if temperature is maintained at 40 deg F or above during work and cure period, and space is well ventilated and kept free of water.

PART 2 - PRODUCTS

2.1 WATERPROOFING MATERIALS

- A. Crystalline Waterproofing: Prepackaged, gray-colored proprietary blend of portland cement, specially treated sand, and active chemicals that, when mixed with water and applied, penetrates into concrete and concrete unit masonry and reacts chemically with the byproducts of cement hydration in the presence of water to develop crystalline growth within substrate capillaries to produce an impervious, dense, waterproof substrate; that has VOC content complying with limits of authorities having jurisdiction; with properties meeting or exceeding the criteria specified below.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Kryton Group of Companies (The); Krystol T1 & T2 Waterproofing System.
 - 2. Water Permeability: Maximum zero for water at 30 feet when tested according to CE CRD-C48.
 - 3. Compressive Strength: Minimum 4000 psi at 28 days when tested according to ASTM C109/C109M.

2.2 ACCESSORY MATERIALS

- A. Patching Compound: Factory-premixed cementitious repair mortar, crack filler, or sealant recommended by waterproofing manufacturer for filling and patching tie holes, honeycombs, reveals, and other imperfections; compatible with substrate and other materials indicated; and VOC content complying with limits of authorities having jurisdiction.
- B. Plugging Compound: Factory-premixed cementitious compound with hydrophobic properties and recommended by waterproofing manufacturer; resistant to water and moisture but vapor permeable for all standard applications (vertical, overhead, and horizontal surfaces not exposed to vehicular traffic); compatible with substrate and other materials indicated; and VOC content complying with limits of authorities having jurisdiction.
- C. Portland Cement: ASTM C150, Type II.
- D. Sand: ASTM C144.
- E. Polymer Admixture for Protective Topping: Polymer bonding agent and admixture designed to improve adhesion to prepared substrates and not to create a vapor barrier.
- F. Water: Potable.

2.3 MIXES

- A. Crystalline Waterproofing: Add prepackaged dry ingredients to water according to manufacturer's written instructions. Mix together with mechanical mixer or by hand to required consistency.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for suitable conditions where waterproofing is to be applied.
- B. Proceed with application only after unsatisfactory conditions have been corrected.
- C. Notify Engineer in writing of active leaks or defects that would affect system performance.

3.2 PREPARATION

- A. Protect other work from damage caused by cleaning, preparation, and application of waterproofing. Provide temporary enclosure to confine spraying operation and to ensure adequate ambient temperatures and ventilation conditions for application.
- B. Do not allow waterproofing, patching, and plugging materials to enter reveals or annular spaces intended for resilient sealants or gaskets, such as joint spaces between pipes and pipe sleeves.
- C. Stop active water leaks with plugging compound according to waterproofing manufacturer's written instructions.
- D. Repair damaged or unsatisfactory substrate with patching compound according to manufacturer's written instructions.
 - 1. At holes and cracks in substrate, remove loosened chips and cut reveal with sides perpendicular to surface, not tapered, and approximately 1 inch deep. Fill reveal with patching compound flush with surface.
- E. Surface Preparation: Comply with waterproofing manufacturer's written instructions to remove efflorescence, chalk, dust, dirt, mortar spatter, grease, oils, paint, curing compounds, and form-release agents to ensure that waterproofing bonds to surfaces.
 - 1. Clean concrete surfaces according to ASTM D 4258.
 - a. Scratch- and Float-Finished Concrete: Etch with 10 percent muriatic (hydrochloric) acid solution according to ASTM D 4260.
 - b. OR Prepare smooth-formed and trowel-finished concrete by mechanical abrading or abrasive-blast cleaning according to ASTM D 4259.
 - 2. Concrete Joints: Clean reveals according to waterproofing manufacturer's written instructions.

3.3 APPLICATION

- A. General: Comply with waterproofing manufacturer's written instructions for application and curing.
 - 1. Saturate surface with water for several hours prior to application and maintain damp

condition until applying waterproofing. Remove standing water.

2. Apply waterproofing to all concrete Tank and Liquid Containing Structures surfaces as indicated on the Drawings.
3. Number of Coats: Number required for specified water permeability.
4. Application Method: Brush or Spray. Apply to ensure that each coat fills voids and is in full contact with substrate or previous coat.
5. Dampen surface between coats.

B. Final Coat Finish: Smooth.

C. Curing: Moist-cure waterproofing for three days immediately after final coat has set, followed by air drying, unless otherwise recommended in writing by manufacturer.

D. Waterproofing Treatment Extensions: Extend waterproofing treatment as follows:

1. Onto columns integral with treated walls.
2. Onto interior nontreated walls intersecting exterior treated walls, for a distance of 24 inches for cast-in-place concrete.

3.4 FIELD QUALITY CONTROL

A. Inspection: Engage manufacturer's representative to inspect completed application and provide a written report that application complies with manufacturer's written instructions.

END OF SECTION 07162

SECTION 07900 - CAULKING

PART 1 - GENERAL

- 1.1 SCOPE. This section covers caulking and sealing.
- 1.2 GENERAL. The terms "caulking" and "sealing", as used on the Drawings and in these specifications, are synonymous. Both terms indicate the materials specified herein. Oil-base caulking shall not be used on this project.
- 1.3 APPROVALS. All caulking shall meet the requirements of the standards specified herein. All caulking and sealing to be used in contact with potable water shall meet the requirements of ANSI / NSF Standard 61.
- 1.4 SUBMITTALS. Specifications and data covering the materials proposed for use, together with samples or color cards showing the manufacturer's full line of sealant colors, shall be submitted in accordance with the Submittals section.
- 1.5 WARRANTY. A 5 year manufacturer warranty shall be provided from the date of substantial completion for a caulking.

PART 2 - PRODUCTS

2.1 MATERIALS.

Thiokol Sealants (polysulfides)	Fed Spec TT-S-00227E, Class A or ASTM 920 Type M; polysulfide rubber, two component.
Nonsag.	
Submerged Service, Non potable water	Pecora "Synthacalk GC-2+"; Sonneborn "Sonolastic Polysulfide Sealant".
Nonsubmerged Service	Pecora "Synthacaulk GC-2+"; Sonneborn "Sonolastic Polysulfide Sealant"; Polymeric Systems "PSI-350".
Self-Leveling, nonsubmerged	A. C. Horn "Hornflex Traffic Grade"; Polymeric Systems "PSI-350".
Urethane Sealants (Polyurethanes)	Fed Spec TT-S-00227E, Class A, Type 2 and ASTM C920, Type M, Grade NS, two component.
Nonsag.	
Submerged Service	
Potable Water	Polymeric Systems "RC-270"; Sika "Sikaflex-2cNS.
Nonpotable Water	Pecora "Dynatred"; Polymeric Systems "RC-270".
Nonsubmerged Service	Bostik "Chem-Caulk 500"; Tremco "Vulkem

	227"; Pecora "Dynatrol II"; Tremco "DYmeric 240"; Sika "Sikaflex-2cNS".
Self-Leveling, Nonsubmerged Service	Bostik "Chem-Calk 550"; Tremco "Vulkem 245"; Pecora "Urexpan NR-200"; Polymeric Systems "RC-2SL"; Tremco "THC-900".
Acrylic Sealant	Fed Spec TT-S-230; ASTM C834. Bostik "Chem-Calk 600"; Pecora "AC20"; Tremco "Mono 555".
Primer	As recommended by the sealant manufacturer.
Backup Material	Polyethylene or polyurethane foam as recommended by the sealant manufacturer; Dow "Ethafoam SB" or Plateau "Denver Foam".
Bondbreaker Tape	Adhesive-backed polyethylene tape as recommended by the sealant manufacturer.

2.2 COLORS. Colors of sealants shall be as selected by Engineer from the manufacturer's standard line of colors. Different colors may be required for different locations.

2.3 LOCATIONS TO BE CAULKED.

A. With Thiokol or Urethane Sealant (Nonsag) - Submerged Service.

All joints requiring caulking in submerged locations.

B. With Thiokol or Urethane Sealant (Nonsag) - Nonsubmerged Service

Entire perimeter of frames for FRP doors.

Entire perimeter of metal dampers and metal shutters.

Entire perimeter of aluminum windows.

Control joints in masonry walls.

Around service sinks.

Other locations where caulking is indicated on the Drawings, specified in other sections, or required for weatherproofing.

C. With Thiokol or Urethane Sealant (Self Leveling)

Horizontal joints in walks or drives.

Horizontal joints in decks and slabs.

Annular space around handrail posts set in sleeves.

D. With Acrylic Sealant

Watertight joints in sheet metal work.

PART 3 - EXECUTION

- 3.1 JOINT PREPARATION. All surfaces to receive sealant shall be clean, dry, and free from dust, grease, oil, or wax. Concrete surfaces which have been contaminated by form oil, paint, or other foreign matter which would impair the bond of the sealant to the substrate shall be cleaned by sandblasting. All surfaces shall be wiped with a clean cloth saturated with xylol or other suitable solvent, and shall be primed before the sealant is applied.

Unless otherwise recommended by the sealant manufacturer and permitted by the Engineer, the depth of sealant in a joint shall be equal to the width of the joint, but not more than 1/2 inch. Backup material shall be provided as necessary to control the depth of sealant and shall be of suitable size so that, when compressed 25 to 50 percent, the space will be filled. Backup material shall be rolled or pressed into place in accordance with the manufacturer's installation instructions, avoiding puncturing and lengthwise stretching. If depth of the joint does not permit use of backup material, bond breaker tape shall be placed at the bottom of the joint to prevent three-sided adhesion.

- 3.2 SEALING. Sealing work shall be done before any field painting work is started. The air temperature and the temperature of the sealed surfaces shall be above 50°F when sealing work is performed.

Upon completion of the sealing work, each sealed joint shall have a smooth, even, tooled finish, flush with the edges of the sealing recess, and all adjacent surfaces shall be clean. Sealant shall not lap onto adjacent surfaces. Any sealant so applied as to prevent the painting of adjacent surfaces to a clean line, or with an excess of material outside the joint and feathered onto surfaces, shall be removed and the joint resealed.

END OF SECTION 07900

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OPENINGS

1. DESCRIPTION:

- 1.01 Furnish all labor, materials, equipment and services necessary to complete the work as indicated on the Contract Plans and the attached Specification Summary.
- 1.02 All work shall conform to the requirements specified in Part 1 – General, of the Sections listed.

2. MATERIALS:

- 2.01 The materials shall be as specified in Part 2 – Products, of the Sections listed.

3. CONSTRUCTION DETAILS:

- 3.01 The construction details shall be as specified on Part 3 – Execution, if the Sections listed.

4. METHOD OF MEASUREMENT:

- 4.01 This item shall be measured for payment on a lump sum basis for the work completed in accordance with the Contract Documents and as directed by the Engineer.

5. BASIS OF PAYMENT:

- 5.01 Payment for this item shall be made at the lump sum bid price bid. The lump sum price bid shall include cost of furnishing all labor, material, equipment and appliances necessary to complete the work as indicated on the Contract Plans and as specified herein in the Sections listed.
- 5.02 Detailed Estimate:
 - A. Before the first certificate of payment is issued for the work under this item, submit a detailed estimate of quantities and prices for all materials, labor, and other items included under this item, which shall aggregate the contract lump sum price bid for this item. Prepare the detailed estimate in the same sequence as the Sections listed.
 - B. The detailed estimate shall be supported by such evidence, including certified copies of subcontracts, as the Engineer may require.
 - C. The detailed estimate must be approved by the Engineer who may revise it as, in his/her reasonable judgment, is necessary to make the various item conform to their true values. The value of each certificate of payment will be based on the approved detailed estimate.
- 5.03 Monthly payments will be made for this item in proportion to the total amount of work completed.

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OPENINGS

1. SPECIFICATION SUMMARY

1.01 This Item includes the following specifications:

- A. Section 08110 Steel Doors and Frames
- B. Section 08230 Aluminum Flat Cover System
- C. Section 08700 Finish Hardware

1.02 This item shall include, but not be limited to, the following:

- A. New doors, frames, and other associated hardware for the pumphouse upgrade.

SECTION 08110 - STEEL DOORS AND FRAMES

PART 1 - GENERAL

- 1.1 SCOPE. This section covers the furnishing and installation of hollow metal (HM) doors and frames. Unless otherwise indicated or specified, all steel doors shall be flush type.

Steel doors and frames shall be prepared, reinforced and pre-wired to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

Finish hardware is covered in the Finish Hardware section.

- 1.2 GENERAL. Doors, frames, and appurtenances shall be furnished and installed as specified herein and in accordance with the details and arrangements indicated on the drawings.

Doors, frames, and appurtenances furnished under this section shall be fabricated and assembled and erected, in full conformity with drawings, specifications, engineering data, instructions, and recommendations of the manufacturer unless exceptions are noted by Engineer.

- 1.3 SUBMITTALS. Complete detail drawings of all items specified herein shall be submitted in accordance with the Submittals section. Drawings shall show elevations of each door type; details of each frame type; location or identification of each item; typical and special details of construction; methods of assembling sections; location and installation requirements for hardware; size, shape, and thickness of materials; joints; connections; and finish.

- 1.4 DELIVERY, STORAGE, AND HANDLING. Shipping shall be in accordance with the Shipping section. Handling and storage shall be in accordance with the Handling and Storage section.

Materials shall be handled, transported, and delivered in a manner which will prevent bends, dents, scratches, or damages of any kind. Damaged materials shall be promptly replaced.

PART 2 - PRODUCTS

- 2.1 PERFORMANCE AND DESIGN CRITERIA.

- A. Governing Standard. Except as modified or supplemented herein, all steel doors and frames shall conform to the requirements of ANSI/SDI 100, Grade II, Model 2.

1. Metal Thicknesses. Metal thicknesses and gages of steel sheet metal specified herein are the minimum required. Gages refer to US Standard gage.
2. Nomenclature. The nomenclature used herein conforms to ANSI A123.1.

- 2.2 ACCEPTABLE PRODUCTS. Internally reinforced doors and accompanying frames shall be equivalent to the following:

The Ceco Corporation "Medallion"

Curries Manufacturing Company "Series 747T"

Pioneer Industries "Series C"

Republic Builders Products "DS Series"

- 2.3 MATERIALS. Materials used in the manufacture of steel doors and frames shall be as follows:

Doors and Frame	ASTM A366 or A569, stretcher leveled, commercial quality sheet steel with smooth, clean surface.
Internal Reinforcing	ASTM A366, cold-rolled steel.
Fillers for Internally Reinforced Doors	Mineral wool or fiberglass.
Urethane Core for foamed in place doors	Liquid urethane, expanded in place self-bonding, self-hardening, and self-extinguishing.
Anchoring Devices	Zinc-plated where exposed; zinc-plated or galvanized where concealed; non-corrosive.
Expansion Anchors	As specified in the Anchorage in Concrete and Masonry section.
Tape Sealant	PVC or neoprene closed-cell foam, black, 1/2 inch wide by 1/4 inch thick strip with pressure-sensitive adhesive back; Williams "Everlastic NN-1" or Blanchard "Foamgard".

- 2.4 FRAMES. Frames for doors, transoms, mullions, and interior glazed panels shall be formed of steel to the sizes, 14 gage, and shapes required.

- A. Workmanship. The finished work shall be strong, rigid, neat, and free from defects. Molded members shall be fabricated straight and true, with corner joints well formed, and with fastenings concealed where practicable.
- B. Joints. Joints for frames shall be mitered or butted and continuously welded on the reverse side to produce rigid joints which are invisible on the face of the frame. Frame bottoms shall be held rigidly in position by spreader bars to maintain proper alignment during shipment and erection.
- C. Hardware Provisions. Frames shall be prepared at the factory for the specified hardware. Frames shall be mortised, reinforced, drilled, and tapped for mortised hardware, and shall be reinforced for surface-applied hardware. Cover boxes shall be provided in back of all hardware cutouts. Frames for all doors except weather-stripped doors shall be punched to receive silencers, three holes on the lock side of single door frames and one hole for each leaf in heads of double door frames. Lock strikes shall be set out and adjusted to provide clearance for silencers.

Concealed metal reinforcements shall be provided for hardware in at least the following thicknesses:

Hinge reinforcement	10 gage
Strike reinforcement	14 gage
Closer reinforcement	12 gage
Other reinforcement	14 gage

- D. Mullions and Transom Bars. Mullions and transom bars shall be of reinforced tubular construction, connecting neatly with heads and jambs and secured in place by concealed interlocking joints or by welding. Removable transom bars shall be connected to frames at jambs by concealed fasteners. Cutouts or removable plates shall be provided for access to fasteners.
- E. Reinforcing. Where structural steel members are indicated at mullions, transoms, or other locations, and are required to be built into hollow metal frames, the structural steel shapes shall be provided as part of the frame assembly.
- F. Wall and Floor Anchors. Metal anchors of the sizes and shapes required for the adjoining type of wall construction shall be provided. Jamb anchors shall be fabricated from steel, of at least the same thickness as the frames. Anchors shall be located near the top and bottom of each frame and at intermediate points spaced not more than 32 inches apart.

For frames set in masonry, jamb anchors shall be at least 10 inches long, adjustable, and corrugated or other deformed type.

Door frames shall be provided with a 16 gage thick base clip at each jamb for floor anchorage. Clips shall be sized and drilled for at least two 3/8 inch diameter anchoring devices. Where floor fill occurs at a door opening, the bottom of the frame shall terminate at the indicated finished floor level and shall be supported by adjustable extension clip angles anchored to the structural slab.

- G. Stops and Beads. Metal glazing beads shall be furnished with hollow metal frames at transoms, sidelights, interior glazed panels, and other locations where glazed frames are indicated on the drawings. Glazing stops shall be formed as an integral part of the frames, and the frames shall be prepared to receive the glazing beads. Where frames are exposed to weather, the integral stops shall be located on the exterior side of the frames. Beads having a molded shape shall be mitered at corners. Rectangular beads may be either mitered or butted at corners.
- 2.5 DOORS. Doors indicated on the drawings as hollow metal, including doors with glazed shall be as specified herein. Doors shall be prepared to receive the hardware specified in the Finish Hardware section.
- A. Workmanship. Doors shall be rigid, neat in appearance, and free from defects. Molded members for glazed doors shall be formed straight and true, with joints coped or mitered, well formed, and in true alignment. All welded joints on exposed surfaces shall be dressed smooth so that they are invisible after finishing.
 - B. Sizes and Clearances. Doors shall be of 1-3/4 inch thickness, and type indicated on the

drawings, of the sizes and design indicated. Clearances for doors shall be 1/8 inch at jambs and heads, 1/4 inch at meeting stiles of pairs of doors, and 3/4 inch at bottom, unless otherwise indicated.

- C. Construction. Doors shall have 18 gage thick seamless outer sheets. Side edges of doors shall be flush and closed watertight. All seams shall be continuously welded and ground smooth. Doors shall be prepared at the factory for hardware and for glazing as indicated on the drawings. Door edges shall be beveled or rounded.

Flush internally reinforced doors shall have fillers placed in the spaces between reinforcing members and shall be reinforced by 22 gage thick or thicker vertical steel stiffeners installed on 6 inch centers and welded to face sheets.

Out-swinging exterior doors shall be finished flush at the top, with all seams and joints closed watertight as specified for side edges.

- D. Hardware Provisions. Doors shall be mortised, reinforced, drilled, and tapped for mortised hardware. Reinforcing units shall be provided for locksets. Reinforcing plates shall be provided for mortised and surface-applied hardware in at least the following thicknesses:

Hinge reinforcement	10 gage
Surface-applied closers and hold-open arms	
Other reinforcement	14 gage

The locations of hardware items shall be in accordance with DHI "Recommended Locations for Builders' Hardware for Standard Steel Doors and Frames".

- E. Stops and Beads. Metal glazing beads shall be furnished with hollow metal doors where glazed doors are indicated on the drawings. Glazing stops may be formed as an integral part of the doors, or separate glazing beads provided for both sides of the glass. Doors shall be prepared to receive the glazing beads. Beads shall be snapped into place, or shall be fastened with oval-head machine screws spaced at 9 inch centers maximum. Beads having a molded shape shall be mitered at corners. Rectangular beads may be either mitered or butted at corners.

Where glazed doors are exposed to weather, all seams and joints on all sides of the glass panel, except joints in removable beads, shall be closed watertight as specified for side edges.

- F. Astragals. The meeting edges of all exterior double doors, of interior double doors scheduled to be weather-stripped shall be provided with astragals. Astragals shall be applied to the active leaf unless otherwise indicated. When the astragal is attached to the inactive leaf, the active leaf shall be prepared for a lockset with a 3-3/4 inch backset.

- 2.7 SHOP FINISH. A primer shall be applied to all surfaces of ferrous metal furnished under this section. Metal surfaces shall be cleaned and given a phosphate or equivalent treatment to ensure maximum corrosion protection and paint adherence. A dip or spray coat of synthetic resin, rust-inhibitive metallic oxide, or rust-inhibitive zinc chromate primer shall be applied to all surfaces, then baked or oven-dried. Finished surfaces shall be smooth and free from irregularities.

PART 3 - EXECUTION

- 3.1 INSTALLATION. Frames shall be set in position, plumbed, aligned, and braced securely until permanent anchors are set. Frames shall be anchored to floors with expansion anchors or as indicated on the drawings. Jamb anchors shall be built into walls and secured to adjoining construction. Spreader bars shall remain in place until frames have been built into the walls.
- A. Glazing Beads. Glazing beads, when provided, shall be fastened to frames with oval-head machine screws spaced at 9 inch maximum centers.

END OF SECTION 08110

SECTION 08230 – ALUMINUM FLAT COVER SYSTEM

PART I - GENERAL

- 1.1 SCOPE. The Contractor shall design and provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install aluminum flat covers systems over the existing process mechanical building as indicated on the Drawings.

Review installation procedures under other Sections and coordinate the installation of items that must be installed prior to or with the aluminum flat cover systems. The Contractor must perform all necessary tank field measurements to obtain dimensions for the proper design of the flat cover system. It is the Contractor's responsibility to verify or determine the dimensions of the structures in the field and to design covers and supports to conform to field conditions. No separate or additional payment will be made for special designs of covers or supports or for any additional demolition or construction work to accommodate actual field conditions.

- 1.2 GENERAL. Obtain all equipment specified in this Section from a single manufacturer regardless of the component manufacturer.

- A. General Equipment Requirements. The General Equipment Requirements, as outlined in Section 01610, General Equipment Requirements, shall apply to all equipment furnished under this section. If requirements in this specification differ from those in the General Equipment Requirements, the requirements specified herein shall take precedence.

- 1.3 REFERENCES. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

Specifications for Aluminum Structures as published by Aluminum Association.

Aluminum Standards and Data, latest edition.

AISC Specifications for Structural Steel Buildings, latest editions.

ANSI H35, American National Standards on Aluminum and Aluminum Alloys (latest edition).

ASTM A276, Standard Specification for Stainless Steel Bars and Shapes (latest edition).

ASTM A666, Standard Specification for Annealed or. Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar (latest edition).

ASTM B209, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (latest edition).

ASTM B308, Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles (latest edition).

ASTM F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs (latest edition).

1.4 SUBMITTALS.

A. Shop Drawings. The data submitted shall include the following:

1. Drawings: Detailed drawings in plan and profile and installation schedules for all equipment showing full details of covers, supports, pipe penetrations, closure pieces, and specials. No equipment shall be ordered for shipment until shop drawings are approved. Shop drawings shall be submitted at a scale large enough to show equipment, pipe, fittings, taps, and all other features clearly.
2. Installation Instructions: Detailed procedures to be used during installation of the aluminum tank covers and appurtenances including manufacturer's recommendations.
3. Bill of Materials: Complete bill of materials, indicating material-composition of equipment, pressure rating, nominal sizes, thicknesses, and their locations on the installation drawings. All items not made but supplied by the manufacturers as part of the aluminum flat cover system shall be identified as such and shall be listed on the same complete bill of materials.
4. Existing Installations: A list of five complete installations similar in size and application to the specified shall be provided by the manufacturer as part of the Shop Drawings package.
5. Evidence of Experience: Suitable evidence of experience in the design, testing, operating, production quality assurance, inspection and testing programs, and fabrication of equipment as specified herein must be submitted for approval. Quality assurance program shall at minimum include established document review, design, production, test and inventory control procedures; metallurgical and strength analysis of castings; physical measurements of components; refinish or repair; shop assembly areas for final check of fit and field supervision and follow-up of installations.
6. Design Calculations: Drawings and calculations Signed and sealed by a registered Professional Engineer, licensed in the State of New York, verifying that covers with all appurtenances including hatches, openings, appurtenances, and the like are capable of withstanding the design conditions specified herein.

B. Drawings and Data. Manufacturer's literature, complete fabrication and assembly drawings signed and sealed by NYSPE, catalog data, illustrations, and engineering data together with detailed specifications, performance and technical data covering materials, dimensions, sizes and weights of all components, parts, devices, and accessories forming a part of the equipment furnished, shall be submitted in accordance with Section 01300, Submittals. The data and specifications for each unit shall include, but shall not be limited to, the following:

Aluminum Flat Cover Systems including Aluminum Trusses and Support Members

Name of manufacturer.

Type and model.

Complete description in sufficient detail to permit item by item comparison with the specifications.

Dimensional layout drawings showing installation details and required clearances.

Materials of construction.

Dynamic forces imposed on structures.

- C. Samples. Contractor shall furnish a sample of the proposed cover system with the shop drawing submittal.
- D. Contractor's and Manufacturer's Services. The manufacturer shall include the services of at least one (1) qualified factory trained representative, unless otherwise specified below, who shall provide the following services:
 - 1. Construction Services: Supervise and, assist as necessary in the installation of the covers and hatches for a proper installation of the cover system specified herein.
 - 2. Inspection Services: Check the installation before it is placed into service and make all necessary adjustments to place the cover system into satisfactory service.
 - 3. Acceptance Testing: Supervise the system test work as specified herein including necessary adjustments.

1.5 DELIVERY, STORAGE, AND HANDLING. Shipping, handling and storage shall be in accordance with Specification Section 01612.

- A. Shipping: Preassemble items in the shop to the greatest extent possible so as to minimize field splicing and assembly of units at the Project site.

Disassemble units only to the extent necessary for shipping and handling limitations.

Clearly mark units for reassembly and coordinated installation. All material labels, tags, and marks shall be intact and legible. Use tags indicating lengths and other information corresponding to markings shown on placement drawings and installation instructions.

- B. Delivery. 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 not delay that Work.

All necessary precaution shall be taken to prevent damage to the aluminum flat covers including all appurtenances during shipment and delivery. All materials shall be securely fastened to truck or other applicable means of transportation to prevent movement or damage during shipment.

All boxes, crates, and packages shall be inspected by the CONTRACTOR upon delivery to the site before and after unloading. CONTRACTOR shall notify ENGINEER of any loss or damage to equipment or components.

- C. Handling: Handle and store all equipment carefully to prevent damage. Aluminum flat covers and all other components of the system shall not be dropped, rolled, or pushed off from any height of delivery, storage, or installation. Any damaged equipment will not be acceptable. Replace losses in accordance with manufacturer's instructions in a manner acceptable to the

ENGINEER.

- D. Storage. Aluminum flat covers and all other components of the system shall be stored at the site in the vertical position on heavy wood blocking so that no point will come in contact with the ground.

1.6 QUALITY ASSURANCE. Except as otherwise specified or shown, all design, materials, joints, connections and workmanship shall conform to the design and fabrication criteria as listed in Part 2, Products, of this Section.

- A. Source Quality Control. The aluminum flat covers, appurtenances, and all other components of the system shall be furnished by a single manufacturer who shall assume unit responsibility for the proper design, operation, and interfacing of all equipment and supports specified herein. Similar units that comprise a system shall be identical. Similar components of each unit shall be the product of a single manufacturer.
- B. Manufacturer's Qualification. The manufacturer of the equipment specified under this Section shall meet the requirements of the Division 1 and the additional requirements specified herein.

The manufacturer shall have experience in the design, fabrication, matching of components, quality assurance program wherein components and products are regularly tested, shop assembly and final inspection facilities, fabrication and operation, and shall be regularly engaged in manufacturing, installing, and servicing aluminum flat covers and appurtenances of the type and character required by this Specification Section.

The manufacturer shall submit information indicating a minimum of five (5) successful installations similar in size and application where they have designed, fabricated, and installed covers and appurtenances similar to those specified herein that are in satisfactory operations of a minimum of three (3) years. Information shall at a minimum include location, installation date, service, capacity, records of any maintenance performed by the manufacturer, and a name of Owner contact person.

- C. Quality Assurance. Quality assurance program shall at minimum include established document review, design, production, test and inventory control procedures; metallurgical and strength analysis of castings; physical measurements of components; refinish or repair; shop assembly areas for final check of fit and field supervision and follow-up of installations.

1.7 WARRANTY. Submit written warranty signed by the manufacturer, the installation subcontractor if applicable, and the Contractor, agreeing to replace, at no additional cost to the Owner, any aluminum flat cover system components which fail in materials, workmanship, or performance within one (1) year of the date of final completion and acceptance of the project by the Owner.

1.8 PROTECTION. The Contractor shall protect all surfaces of aluminum flat covers from contact with any dissimilar materials including concrete, masonry, steel, nonferrous metals, etc. using approved washers, strips or sheets of felt, asphaltic or zinc chromate paint, or other approved means of protection.

PART 2 - PRODUCTS

2.1 MANUFACTURERS. Covertite System by Thermacon Industries, Inc.; Hallsten Corporation

or approved equal.

2.2 DESIGN CRITERIA. Design the entire structures to sustain the loads specified herein, with stress limitations of the Aluminum Associations' Specifications for Aluminum Structures, and in accordance with applicable local codes.

A. Utilize the load cases described below unless more severe loads are determined to be applicable by the manufacturer.

1. Dead Load: The dead load is defined as the weight of the structure and all material permanently attached to and supported by the structure.
2. Live Snow and Wind Loads. See structural plan load specifications.
3. Load Combinations. As prescribed in New York State Building Code, latest Edition.
4. Temperature. Consider the load combinations listed above for a material temperature range of -20°F to 115°F.
5. Water Penetration. No leakage at four (4) pounds per square foot pressure with spray test.
6. Air Infiltration. 0.02 cubic feet per minute per square foot for gross cover area, with four (4) pounds per square foot differential pressure.
7. Additional Panel Design Load. In addition to the above-mentioned loads and load combinations, design the aluminum panels for a 250 pound load distributed over 1 sq ft at any location and a plus or minus 40-psf load distributed over the entire area of any given panel. These loads are to be taken as acting simultaneously with one another and not simultaneously with other design loads.

C. Limit deflection to L/240. Deflection limits apply to every component of the cover system in both directions.

2.3 MATERIAL. The following materials shall be utilized in manufacture of the aluminum flat cover panels:

Aluminum Flat Covers	
Panels	Mill finish, 5086-H111 Aluminum. The cover shall be bent form and air sealed by elastomeric joint sealant
Gaskets	Spliced and vulcanized Neoprene Mil-R-900, 25 durometer. The use of sponge neoprene shall not be acceptable.
Fasteners	Type 316 stainless steel, ASTM F593
Extrusions	ASTM B209 alloy 6061 or 5052, or ASTM B308 alloy 6061 aluminum.
Aluminum Trusses and Support Members	
Structural aluminum shapes, plates, and bars.	Aluminum alloy 6061-T6
Stainless steel bolts and nuts	ASTM A276, Type 316

Stainless steel plate and washers	ASTM A666, Type 316, Grade B or C
Stainless steel anchor bolts	ASTM A276, Type 316

- 2.4 COMPONENTS. All aluminum flat covers shall be designed air-tight and water-tight, not allowing air or water from below the covers to escape or air and water from above the covers to infiltrate into the tanks or channels. All edges of cover panels shall be covered and sealed in an interlocking manner to prevent slipping or disengagement under all load and temperature conditions. The cover panels shall be clear-span and designed to be self-supporting. No intermediate supports between covers or cover sections shall be allowed. Provisions shall be made to allow for expansion and contraction. The covers shall provide an effective seal for the design conditions specified below.

Provide covers with appurtenances as shown on the Drawings.

- 2.5 ACCESSORIES. Provide accessories including hatches, makeup air inlets with dampers, hinged or removable covers, slide gate frame covers and duct penetration sleeves at the locations shown on the Drawings.

- A. Access Hatches. Provide hatches at the locations, quantities and clear opening dimensions as shown on the Drawings. Mount hatches on two (2") inch (minimum) high extrude structural aluminum frames. Fabricate hatch lids of 0.090 inch minimum thickness, aluminum with a downward overlap of the hatch frame of two (2") inches with gaskets for an airtight seal.

Furnish lids with a lifting handle and positive locking device to insure air tightness in the locked position. Provide a minimum of 2 such devices per hatch. Reinforce hatch openings with aluminum channel on the underside of the surrounding panel. Provide hatches with aluminum medium duty commercial hinge assemblies and stainless steel fastening devices. Provide a hasp for a padlock on each hatch.

- B. Exhaust Air Duct Connection. Provide flanged duct connection as shown on the Drawings. Flange to be compatible to connecting flange of ventilation duct.

2.6 FABRICATION. Provide fabrication for the following aluminum flat cover components as described below:

The Contractor is responsible for field survey verification of all dimensions shown on the drawings prior to fabrication of any part of the aluminum flat covers and associated trusses and support members.

- A. Aluminum Flat Covers. The aluminum flat covers shall be designed to provide the minimum opening dimensions as shown on the Drawings.

The weight of any cover panel shall not exceed 150 pounds with a minimum weight of 120 pounds.

Aluminum covers shall be designed to permit the removal of a single cover without needing to remove more than only one adjacent cover.

No multiple covers shall be allowed for any given span.

The covers shall be removable by plant personnel without the use of special lifting equipment.

The direct attachment of a cover panel to the surface of frame members by means of bolts, screws, or self-drilling fasteners extending through the panels, outer top flanges, or outer edges of the panel will not be acceptable.

No more than six (6) bolts or screws shall be required for the removal of any one panel.

Horizontal joints between male and female panels shall be gasketed with a compressible neoprene gasket mechanically attached to one of the panels. No caulking sealant or adhesive gasket material shall be used. No secondary sealing or caulking shall be used to achieve tightness.

Lift pockets or handles without the penetration of covers shall be provided with each panel to provide for manual removal and placement of panels.

Pipe penetrations through the covers shall meet the above water penetration and air infiltration requirements. Pipe penetrations may be aligned at cover joints, have non-removable portions of covers with adequate supports, or other suitable technique applied to meet the design requirements.

- B. Aluminum Trusses and Support Members. In addition to requirements set forth herein, conform to the applicable AA and AISC reference specifications and standards, and to the best practices of the industry for conditions that are without established guidelines.

Thoroughly clean and straighten materials before fabrication. After working component parts, remove twists and bends before assembly.

1. Layout. Holes may be center punched and cut-off lines may be punched or scribed. Do not punch or scribe where such marks would remain visible on fabricated materials.

Apply a temperature correction where necessary in layout of critical dimensions. The coefficient of expansion shall be taken as 0.000012 inches per degree Fahrenheit.

2. Cutting. Material may be sheared, sawed, cut with a router, or arc cut. Plane (mill) all edges which are cut by the arc process to remove edge cracks.

Cut edges true, smooth, and free from excessive burrs or ragged breaks. Avoid re-entrant cuts wherever possible. If used, fillet by drilling prior to cutting.

Oxygen/gas cutting of aluminum alloys shall not be permitted.

3. Heating. Heat structural materials only as follows:

Materials may be heated to a temperature not to exceed 400 degrees F for a period not exceeding 30 minutes. Heat only when proper temperature controls and supervision are provided to ensure that the limitations on temperature and time are carefully observed. Reduce allowable stress consistent with mechanical properties specified for the material after the heating if structural material is subjected to elevated temperatures or times in excess of the foregoing.

4. Punching, Drilling, and Reaming. Observe the following rules for punching, drilling, and reaming:

Bolt holes may be either punched or drilled. Do not punch holes if the metal thickness is greater than the diameter of the hole. The amount by which the diameter of a subpunched hole is less than that of the finished hole shall be at least 1/4 the thickness of the piece and in no case less than 1/32 inch.

The finished diameter of holes for bolt shall be not more than 1/16 inch larger than the nominal bolt diameter.

Ream holes that must be enlarged to admit bolts. Poor machining of holes shall be the cause for rejection. Do not drill holes in such a manner as to distort the metal. Remove all foreign materials and chips from contact surfaces before assembly.

5. Identification Marks. Employ a method of marking and identifying fabricated pieces that will not show in the finished work. Work of this Section will not be painted or otherwise covered, and therefore, appearance of the shop fabricated materials will be the final finish appearance and visible markings will be objectionable.

- 2.7 FINISHES. The aluminum flat cover panels and all closure pieces and accessories shall be anodized etched after fabrication with architectural Class 1 anodized finish on all sides, AA-M12C22A41, clear, as specified by the Aluminum Association.

The aluminum trusses and support members shall receive mill surface finish. No shop coating will be required on the aluminum trusses and support members.

- 2.8 SOURCE QUALITY CONTROL. The manufacturer shall be experienced in the design and fabrication of the aluminum flat covers as specified. The manufacturer shall maintain a continuous quality program and shall furnish certified results of the following physical standard tests for the covers:

Strength.

Impact.

The manufacturer shall inspect the aluminum flat covers components and rectify all noted deficiencies prior to shipment.

- A. Verification of Performance. The aluminum flat cover manufacturer shall submit written verification that all items has been inspected and approved prior to shipment.

PART 3 - EXECUTION

- 3.1 EXAMINATION. Inspect and verify that structures on which the aluminum flat cover system will be installed have no defects that will adversely affect installation. Inspect all equipment prior to installation. Promptly report defects or unsatisfactory conditions that may affect the installation Work to the ENGINEER in writing. Do not proceed with Work until the defects or unsatisfactory conditions have been corrected in a manner acceptable to the ENGINEER.

- 3.2 INSTALLATION. Equipment and materials furnished under this section shall be installed in proper operating condition in full conformity with the Drawings, Contract Specifications, engineering data, instructions, approved shop drawings, and recommendations of the equipment manufacturer, unless exceptions are noted by ENGINEER.

Prior to enclosure assembly, all material will be cleaned so that all dust, dirt, oil, grease, or other foreign matter will be effectively removed.

Any part of the aluminum flat covers system that is damaged during fabrication, shipment, handling, or erection, including structural members and panels, shall be replaced.

Field welding of aluminum is prohibited.

- A. Aluminum Flat Covers Installation. Aluminum flat covers shall be field erected in strict accordance with the manufacturer's written instructions by workmen experienced; and skilled in the erection of aluminum. Each cover shall be erected properly aligned as shown on the Drawings.

Covers shall be mounted on the concrete perimeter wall in accordance with the manufacturer's written instructions.

The manufacturer shall supervise the installation of the aluminum flat covers. The installation shall allow easy removal and reinstallation of the covers.

- B. Aluminum Trusses and Support Members Installation. Aluminum trusses and support members shall be field erected in strict accordance with the manufacturer's written instructions by

workmen experienced and skilled in the erection of aluminum. Each truss and support member shall be erected properly aligned as shown on the Drawings.

1. Inspection. The Contractor shall field verify governing dimensions of existing and new structures and conditions at the job site before commencing erection Work.

The Contractor shall verify locations and elevations of all anchor bolts, erection plates, and concrete surfaces. The verified locations and elevations shall conform to the following tolerances for anchor bolts and concrete surfaces:

Elevations of concrete surfaces: Plus or minus 3/8 inch.

Elevation at top of anchor bolts: Plus 1 inch, minus 3/8 inch.

Out-of-position of anchor bolts: Plus or minus 1/8 inch.

2. Erection. Erect all structural aluminum in accordance with applicable provisions of AISC Specifications, except as may be limited herein or a limited-by reference specifications and standards for aluminum. Protect aluminum, exercise care in handling to prevent defacement.
3. Field Assembly. Members and sections of sizes, weights, shapes, and true arrangements indicated, shall be closely fitted and finished true to line and in precise position necessary to allow accurate erection and proper jointing of parts in the field.

Provide temporary bracing and guying to support all loads to which the structure may be subjected. Maintain the erected structure in a safe and stable condition during every stage of construction.

Drilling to enlarge unfair holes will not be permitted.

Do not heat aluminum sections except as specified in Part 2 of this Section.

4. Bolting. Except as otherwise indicated on the Drawings, provide bolted connections at all locations using Type 316 stainless steel hex head bolts, hex head nuts, and circular flat plate washers under the head and nut of all bolts.

Use the following procedure when tightening joints:

Fair-up holes with enough bolts to maintain dimensions and trueness of structure, and run-up nuts to snug conditions.

Install bolts in remaining holes and tighten to snug in a pattern similar to riveting. Make sure that connected parts are properly fitted.

Tighten all bolts to 8.0 ksi. Proceed systematically from the most rigid part of the connection to its free edges. Use turn-of-nut method or calibrated (torque) wrench method.

Retighten first tightened bolts that may have become loosen by tightening subsequent bolts, until all bolts are tightened to uniform tension.

5. Sequence. Carry out erection of structural aluminum work in proper sequence with work of other trades, and in accordance with detailed Drawings and approved setting diagrams.

3.3 FIELD QUALITY CONTROL.

Contractor shall inspect all parts of the aluminum flat cover system and all accessories for conformance with the Drawings, Specifications, manufacturer's approved shop drawings, and the manufacturer's installation instructions, and adjust components for proper operation.

A. Manufacturer's Services:

1. Manufacturer's Field Visits. For aluminum flat cover system installation, furnish the services of a qualified manufacturer's representative to visit the site of the Work and inspect, check, adjust if necessary, and approve the equipment installation. The representative shall assist in the installation of the equipment, check the installation before it is placed into operation. The representative shall revisit the job site as often as necessary until all deficiencies are corrected and the equipment installation and operation are satisfactory in the opinion of ENGINEER.
2. Manufacturer's Repair Services. Provide the services of a factory trained service representative of the manufacturer to correct defective work during the one-year correction period.
4. Manufacturer's Repair Services. Provide the services of a factory trained service representative of the manufacturer to correct defective work during the warranty correction period.

END OF SECTION 08230

SECTION 08700 - FINISH HARDWARE

PART 1 - GENERAL

- 1.1 SCOPE. This section covers finish hardware for doors. All electric access control requirements shall be coordinated with the provided doors and frames.
- 1.2 GENERAL.
- A. Templates. Each hardware manufacturer shall deliver to the door and frame manufacturer a template for each item of mortised and surface-applied hardware. Each template shall be labeled with the manufacturer's name, hardware item, opening number, and location on the door or frame where the item is to be installed.
 - B. Packaging. Each item of hardware shall be packaged separately in an individual container complete with screws, keys, special wrenches, instructions, and installation templates necessary for accurately locating, setting, adjusting, and attaching the hardware. Each container shall be marked with the number of the opening to which the hardware item is to be applied.
 - C. Protection. Special care shall be taken to protect finished surfaces of hardware during installation. Hardware on which the finish has been damaged prior to final acceptance of the work shall be replaced with new hardware at no additional cost to the Owner.
 - D. Adjustment. Each supplier of finish hardware shall provide the services of a trained and experienced hardware consultant to service and adjust installed hardware.
 - E. Door and Frame Preparation. Related Division 8 Section - Steel Doors and Frames shall be prepared, reinforced and pre-wired to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.
- 1.3 SUBMITTALS. A complete schedule of finish hardware shall be submitted in accordance with Section 01300, Submittals. The schedule shall indicate each item of hardware required for each opening, manufacturer's name, manufacturer's number or symbol, and finish.

PART 2 - PRODUCTS

- 2.1 ACCEPTABLE MANUFACTURERS. The catalog numbers, which appear in the Hardware Schedule, identify products of the first-named of the manufacturers listed herein for each hardware item. Equivalent products of the other manufacturers listed herein will also be acceptable with the approval of the Engineer.

Product	Manufacturer(s)
Butts	Stanley, Hager, or McKinney.
Locksets and latch sets and cylinders	Best
Exit devices	Von Duprin or Corbin-Russwin
Closer	LCN, Sargent, or Corbin-Russwin

Product	Manufacturer(s)
Bumpers and Silencers	Ives or Corbin-Russwin
Thresholds, cast abrasive	Wooster, American Abrasive, or Stubbs.
Drip caps, extruded	Reese, Zero, or Pemko.
Push plates, pull plates, and kickplates	Baldwin or Quality.
Weatherstripping	Reese, Zero, or Pemko.

- A. Finish. Provide finishes complying with BMHA A156.18. Hardware shall have BMHA 630 finish (brushed stainless steel); items not available in stainless steel shall have BMHA 626 (brushed satin chrome) or mill finished aluminum. Exterior surfaces of door closers shall be finish painted with shop-applied, powder coated finish. Machine screws, bolts, and other exposed attachments shall be finished to match hardware.
- B. Keying. All cylinder locks shall be keyed in groups to match the existing key system already established by the Owner. All cylinders shall be furnished with interchangeable cores. After the finish hardware submittals have been accepted by the Engineer, the Owner will meet with the Contractor to determine the keying groups. All locks in each group shall be keyed alike and each group shall be keyed differently. Two (2) "Do Not Duplicate" keys shall be provided with each lock.

All exterior doors shall be provided with electric access control. All electric access control requirements shall be coordinated with the provided door hardware.

PART 3 - EXECUTION

- 3.1 INSTALLATION. Hardware shall be accurately fitted, securely applied, carefully adjusted, and lubricated in accordance with the manufacturer's instructions.
- A. Location. Unless otherwise directed by the Engineer, the locations of hardware items shall be in accordance with DHI "Recommended Locations for Builders' Hardware for Standard Steel Doors and Frames".
- B. Thresholds. The ends of thresholds shall be notched to fit the applicable door frame profile. Thresholds shall be field drilled to receive flush bolts where required. Thresholds shall be anchored to concrete by means of 5/16 inch diameter stainless steel flat head countersunk machine screws and expansion anchors spaced at 8 inch centers. Thresholds shall be set in asphalt roofing cement conforming to ASTM D4586, Type II.
- 3.2 HARDWARE SCHEDULE. Hardware shall be furnished in accordance with the following groups. A complete set of hardware is listed for each group. Each door will have a hardware group designated in the door schedule on the Drawings.

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HW-1 (Exterior, 3'-0"x7'2", Door 101, and 102. Locked, Panic, Card reader Access)	Number Required	Catalog Number	Manufacturer
Hinges (Heavy Weight)	3	T4A3386 NRP 4-1/2" x 4-1/2" US32D	McKinney
Exit Device	1	8874 ETL Electrified	Sargent
Cylinder	1	Cylinder keyed to existing system	
Door Closer	1	SRI 351 CPSH	Norton
Threshold	1	252x2AFG	Pemko
Gasketing	1	2891AS head and 290AS jamb	Pemko
Rainguard	1	346C	Pemko
Sweep	1	18061CNB	Pemko

END OF SECTION 08700

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SPECIALTIES

1. DESCRIPTION:

- 1.01 Furnish all labor, materials, equipment and services necessary to complete the work as indicated on the Contract Plans and the attached Specification Summary.
- 1.04 All work shall conform to the requirements specified in Part 1 – General, of the Sections listed.

2. MATERIALS:

- 2.01 The materials shall be as specified in Part 2 – Products, of the Sections listed.

3. CONSTRUCTION DETAILS:

- 3.01 The construction details shall be as specified on Part 3 – Execution, if the Sections listed.

4. METHOD OF MEASUREMENT:

- 4.01 This item shall be measured for payment on a lump sum basis for the work completed in accordance with the Contract Documents and as directed by the Engineer.

5. BASIS OF PAYMENT:

- 5.01 Payment for this item shall be made at the lump sum bid price bid. The lump sum price bid shall include cost of furnishing all labor, material, equipment and appliances necessary to complete the work as indicated on the Contract Plans and as specified herein in the Sections listed.
- 5.02 Detailed Estimate:
 - A. Before the first certificate of payment is issued for the work under this item, submit a detailed estimate of quantities and prices for all materials, labor, and other items included under this item, which shall aggregate the contract lump sum price bid for this item. Prepare the detailed estimate in the same sequence as the Sections listed.
 - B. The detailed estimate shall be supported by such evidence, including certified copies of subcontracts, as the Engineer may require.
 - C. The detailed estimate must be approved by the Engineer who may revise it as, in his/her reasonable judgment, is necessary to make the various item conform to their true values. The value of each certificate of payment will be based on the approved detailed estimate.
- 5.03 Monthly payments will be made for this item in proportion to the total amount of work completed.

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SPECIALTIES

1. **SPECIFICATION SUMMARY**

- A. Section 10165 Plastic Laminate Toilet Compartments
 - B. Section 10800 Toilet, Bath, and Laundry Accessories
- 1.02 This item shall include, but not be limited to, the following:
- A. Toilet room accessories such as toilets, etc.

SECTION 10165 - PLASTIC LAMINATE TOILET COMPARTMENTS

PART 1 - GENERAL

- 1.1 SCOPE. This section covers the furnishing and installation of plastic laminate toilet compartments and plastic laminate urinal screens as indicated on the Drawings.
- 1.2 GENERAL. The compartments and screens shall be the products of a single manufacturer. Manufacturers shall be regularly engaged in the manufacture of the types indicated and specified. The compartments and screens shall be furnished complete with all hardware and appurtenances necessary for a satisfactory installation.
- Installation of toilet partitions and urinal screens shall be as indicated on the Drawings and in accordance with manufacturers' instructions.
- 1.3 DELIVERY, STORAGE AND HANDLING. Shipping, handling and storage shall be in accordance with Section 01612.
- Damaged items will be rejected and shall be replaced.
- 1.4 SUBMITTALS. Complete specifications, detailed drawings, and setting or installation drawings covering arrangement, dimensions, hardware and accessories, details of construction, finishes, anchoring methods, and installation of the toilet compartments and the screens, together with laminate samples for color selection, shall be submitted in accordance with Section 01300, Submittals.
- 1.5 COLOR SELECTION. Colors for the toilet partitions and urinal screens will be selected by the Owner from the manufacturer's complete line of colors. Solid and patterned colors are required. Procedures for selecting colors shall be as indicated in the Submittals section.

PART 2 - PRODUCTS

- 2.1 PERFORMANCE AND DESIGN CRITERIA.
- A. General. Toilet partitions shall be overhead braced. Urinal screens shall be wall hung. Locations for different types shall be as indicated on the Drawings.
- B. Attachment Materials. The partitions and screens will be attached to gypsum board and metal studs.
- C. Configuration. Toilet compartments shall be of the configurations indicated on the drawings.
- D. Finish. All exposed surfaces, other than hardware, shall be covered with a plastic laminate surface material.

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2.2 PRODUCTS.

- A. Toilet Compartments. Floor braced plastic laminate toilet compartments shall be Sanymetal "Normandie", Metpar "Luxor", or Global "Regal".
- B. Urinal Screens. Urinal screens shall be wall hung Sanymetal "Type C", Metpar "WH", or Global "WH".

2.3 CONSTRUCTION.

- A. Construction. Doors, partitions, and pilasters shall be constructed of 1/16 inch plastic laminate, NEMA approved, laminated under pressure, and securely bonded to a solid, 45 lb density particleboard core. Partitions shall be at least 3/4 inch thick, doors shall be 1 inch thick, and pilasters shall be 1-1/4 inches thick. All edges shall be pressure banded with plastic laminate that matches panel surfaces.
- B. Urinal Screens. Urinal screens shall be 24 inches wide by 42 inches high by 1 inch thick, and shall be of the same construction, finish, and color as the toilet partitions. The top of the screens shall be hung 60 inches above the finished floor, unless otherwise indicated on the Drawings.
- C. Hardware and Fittings. Wall and pilaster stirrup brackets shall be anodized aluminum or chromium plated nonferrous metal. Doors shall be hung on gravity hinges having antifriction or ball bearing cams, adjustable to permit the door to be set self-closing, self-opening, or ajar, with operating parts contained within the door. Each door shall be equipped with one cast alloy chromium plated coat hook and bumper, one cast alloy chromium plated concealed latch with stainless steel bolt, and one cast alloy chromium plated combination doorstop and latch keeper.

PART 3 - EXECUTION

- 3.1 INSTALLATION. Toilet partitions and screens shall be installed straight, plumb, level, and rigid, in accordance with the manufacturer's instructions.

Stirrup brackets shall be bolted securely to masonry walls by means of expansion bolts or toggle bolts. Attachment to metal studs or solid blocking shall be with self tapping screws. Toggle bolts, molly bolts, plastic anchors, or other attachment to gypsum wallboard panels will not be acceptable. Exposed bolts and screws shall be provided with chrome plated cap nuts.

Pilasters for floor braced compartments shall be securely anchored to the floor in accordance with the manufacturer's instructions, and the connections shall be concealed with stainless steel or chrome plated shoes.

END OF SECTION 10165

SECTION 10800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Public-use washroom accessories.
 - 2. Warm-air dryers.
 - 3. Childcare accessories.
 - 4. Underlavatory guards.
 - 5. Custodial accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
 - 1. Construction details and dimensions.
 - 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Material and finish descriptions.
 - 4. Features that will be included for Project.
 - 5. Manufacturer's warranty.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.
 - 2. Identify products using designations indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

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1.6 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.8 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PUBLIC-USE WASHROOM ACCESSORIES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:
 - 1. A & J Washroom Accessories, Inc.
 - 2. American Specialties, Inc.
 - 3. Bobrick Washroom Equipment, Inc.
 - 4. Bradley Corporation.
- B. Toilet Tissue (Roll) Dispenser (TTD):
 - 1. Basis-of-Design Product: Georgia Pacific Jumbo Jr. (59209)
 - 2. Description: Multi-Roll Dispenser
 - 3. Mounting: Partition or surface mounted.
 - 4. Operation: Noncontrol delivery with theft-resistant spindle.
 - 5. Capacity: Designed for 9-inch-diameter tissue rolls.
 - 6. Material and Finish: Plastic, Translucent Smoke Grey
- C. Combination Towel Dispenser/Waste Receptacle (PTD):

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1. Basis-of-Design Product: Kimberly Clark Professional MOD (35370)
2. Description: Combination unit for dispensing towels, with removable waste receptacle.
3. Mounting: Recessed with projecting receptacle.
 - a. Designed for nominal 4-inch wall depth.
4. Towel-Dispenser: Kimberly Clark Professional Dispenser (31498)
5. Waste-Receptacle: Kimberly Clark Professional Receptacle (35270)
6. Material and Finish: Stainless steel, No. 4 finish (satin).
7. Liner: Reusable, vinyl waste-receptacle liner.
8. Lockset: Tumbler type for towel-dispenser compartment.

D. Liquid-Soap Dispenser (SD):

1. Basis-of-Design Product: Tough Guy Automatic Foam Soap Dispenser
2. Description: Designed for dispensing soap in lather form.
3. Mounting: Vertically oriented, surface mounted.
4. Capacity: 1,200 mL
5. Materials: Grey ABS Plastic
6. Lockset: Secure tumbler type.
7. Refill Indicator: Window type.

E. Grab Bar (GB):

1. Basis-of-Design Product: Bobrick B-6806X18, B-6806x36, and B-6808x42
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch (1.3 mm) thick.
 - a. Finish: Smooth, No. 4 finish (satin).
4. Outside Diameter: 1-1/2 inches (38 mm).
5. Configuration and Length: As indicated on Drawings.

F. Sanitary-Napkin Disposal Unit (SND):

1. Basis-of-Design Product: Bobrick B-434
2. Mounting: Partition or surface mounted.
3. Door or Cover: Self-closing, disposal-opening cover and hinged face panel with tumbler lockset.
4. Receptacle: Removable.
5. Material and Finish: Stainless steel, No. 4 finish (satin).

2.2 WARM-AIR DRYERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.

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4. Bradley Corporation.

B. Warm-Air Dryer:

1. Basis-of-Design Product: Excel: Xlerator-SB
2. Mounting: Recessed.
3. Operation: Electronic-sensor activated with timed power cut-off switch.
 - a. Operation Time: 30 to 40 seconds.
4. Cover Material and Finish: Stainless steel, No. 4 finish (satin).
5. Electrical Requirements: 110-120V – 11.3-12.2 Amps, 1240-1450 Watts, 50/60 Hz

2.3 UNDERLAVATORY GUARDS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Plumberex Specialty Products, Inc.
2. Truebro by IPS Corporation.

B. Underlavatory Guard:

1. Description: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
2. Material and Finish: Antimicrobial, molded plastic, white.

2.4 CUSTODIAL ACCESSORIES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation.
5. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.

B. Mop and Broom Holder:

1. Basis-of-Design Product: Bobrick B-239
2. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
3. Length: 34 inches
4. Hooks: Four.
5. Mop/Broom Holders: Three. spring-loaded, rubber hat, cam type.
6. Material and Finish: Stainless steel, No. 4 finish (satin).
 - a. Shelf: Not less than nominal 0.05-inch- (1.3-mm-) thick stainless steel.
 - b. Rod: Approximately 1/4-inch- (6-mm-) diameter stainless steel.

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2.5 FABRICATION

- A. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of 15 keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 10800

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EQUIPMENT

1. DESCRIPTION:

- 1.01 Furnish all labor, materials, equipment and services necessary to complete the work as indicated on the Contract Plans and the attached Specification Summary.
- 1.02 All work shall conform to the requirements specified in Part 1 – General, of the Sections listed.

2. MATERIALS:

- 2.01 The materials shall be as specified in Part 2 – Products, of the Sections listed.

3. CONSTRUCTION DETAILS:

- 3.01 The construction details shall be as specified on Part 3 – Execution, if the Sections listed.

4. METHOD OF MEASUREMENT:

- 4.01 This item shall be measured for payment on a lump sum basis for the work completed in accordance with the Contract Documents and as directed by the Engineer.

5. BASIS OF PAYMENT:

- 5.01 Payment for this item shall be made at the lump sum bid price bid. The lump sum price bid shall include cost of furnishing all labor, material, equipment and appliances necessary to complete the work as indicated on the Contract Plans and as specified herein in the Sections listed.
- 5.02 Detailed Estimate:
 - A. Before the first certificate of payment is issued for the work under this item, submit a detailed estimate of quantities and prices for all materials, labor, and other items included under this item, which shall aggregate the contract lump sum price bid for this item. Prepare the detailed estimate in the same sequence as the Sections listed.
 - B. The detailed estimate shall be supported by such evidence, including certified copies of subcontracts, as the Engineer may require.
 - C. The detailed estimate must be approved by the Engineer who may revise it as, in his/her reasonable judgment, is necessary to make the various item conform to their true values. The value of each certificate of payment will be based on the approved detailed estimate.
- 5.03 Monthly payments will be made for this item in proportion to the total amount of work completed.

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EQUIPMENT

1. SPECIFICATION SUMMARY

1.01 This Item includes the following specifications:

A. Section 11060 Equipment Installation

B. Section 11140 Process Submersible Pumps

1.02 This item shall include, but not be limited to, the following:

A. The installation of an outlining of the specific equipment needed to be installed for the pumphouse upgrade.

SECTION 11060 - EQUIPMENT INSTALLATION

PART 1 - GENERAL

- 1.1 SCOPE. This section covers installation of new equipment units that have been provided by Contractor as part of this Work.

Startup requirements shall be as indicated in Specification Sections 01650.

- 1.2 GENERAL. Equipment installed under this Section shall be erected and placed in proper operating condition in full conformity with the Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer.

When pumping units are being installed, hydraulic considerations and definition of terms shall be as set forth in the Hydraulic Institute Standards.

- A. Coordination. When manufacturer's field services are provided by the equipment manufacturer, Contractor shall coordinate the services with the equipment manufacturer.

Flanged connections to equipment including the bolts, nuts, and gaskets are covered in the appropriate pipe Specification Sections.

- 1.3 DELIVERY, STORAGE, AND HANDLING.

- A. Storage. Upon delivery, all equipment and materials shall immediately be stored and protected by Contractor in accordance with Section 01612, until installed in the Work. Equipment shall be protected by Contractor against damage and exposure from the elements. At no time shall the equipment be stored on or come into contact with the ground, grass, or any other type of vegetation. Contractor shall keep the equipment dry at all times.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

- 3.1 INSTALLATION.

- A. General. Equipment shall not be installed or operated except by, or with the guidance of, qualified personnel having the knowledge and experience necessary to obtain proper results as specified in the Specification Sections 01650.

Each equipment unit shall be leveled, aligned, and shimmed into position.

Installation procedures shall be as recommended by the equipment manufacturer and as required herein. Shimming between machined surfaces will not be permitted.

Unless otherwise indicated or specified, all equipment shall be installed on concrete bases. Baseplates shall be anchored to the concrete base with required anchor bolts. For equipment with grouted bases, the space beneath shall be filled with grout as specified in the Grout section. The equipment base shall be grouted after initial fitting and alignment.

Anti-seize thread lubricant shall be liberally applied to the threaded portion of all stainless steel bolts during assembly.

When specified in the equipment Sections, the equipment manufacturer will provide installation supervision and installation checks. For installation supervision, the manufacturer's field representative will observe, instruct, guide, and direct Contractor's erection or installation procedures as specified in the equipment specifications. For installation checks, the manufacturer's field representative will inspect the equipment installation immediately following erection by Contractor, and observe the tests indicated in Startup Requirements Section. The manufacturer's representatives will revisit the site as often as necessary to ensure installation satisfactory to Owner.

3.2 FIELD QUALITY CONTROL.

- A. Installation Supervision. The Contractor shall provide the services of a qualified field installation supervisor of the manufacturer during the equipment installation. Manufacturers' installation supervisor shall observe, instruct, guide, and direct the installing contractor's erection or installation procedures.

Contractor shall include a minimum number of days and trips to the site for Installation Supervision as indicated in each equipment Specification Section. Should, in the Contractor's opinion, the Contractor require additional time for manufacturer's Installation Supervision for a particular piece or pieces of equipment in excess of the minimum time specified, the Contractor shall include the cost of that additional time in the Contractor's price bid.

- B. Installation Check. The Contractor shall provide the services of an experienced, competent, and authorized representative of the manufacturer shall visit the site of the Work and inspect, check, adjust, and approve the equipment installation. The representative shall be present when the equipment is placed in operation, and shall revisit the job site as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of the Owner's Representative.
- C. Installation Certification. The manufacturer's representative shall furnish a written report certifying that the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily.

3.3 STARTUP AND TESTING. Startup requirements, and tests associated with startup shall be as indicated in Specification Sections 01650. Other field tests shall be as indicated in the specific equipment sections. Startup and tests required shall occur in the order listed in the following paragraphs. Tests shall not begin until any installation supervision and installation checks by the equipment manufacturer have been completed, except where noted below.

- A. Preliminary Field Tests. Preliminary field tests shall be conducted on all equipment by Contractor as indicated in Specification Sections 01650. When an installation check is specified in the equipment sections, the equipment manufacturer's representative will

participate in these tests to the extent described in Specification Sections 01650 and in the equipment Sections.

- B. Field System Operation Tests. Field system operation tests shall be conducted on all equipment by Contractor as indicated in Specification Sections 01650. When an installation check is specified in the equipment sections, the equipment manufacturer's service personnel will participate in these tests to the extent described in Specification Sections 01650 and in the equipment Sections.
- C. Field Demonstration Tests. Field demonstration tests will be conducted by the equipment manufacturer on equipment as indicated and as specified in the equipment Sections.
- D. Field Performance Tests. Field performance tests will be conducted by the equipment manufacturer on equipment as indicated and as specified in the equipment Sections.
- E. Field Baseline Performance Tests. Field baseline performance tests shall be conducted by Contractor on the equipment indicated in the equipment Sections, and the tests shall be performed as indicated. When indicated in the equipment Sections, the equipment manufacturer will participate in these tests. This test shall not be considered an acceptance test, but rather a test to determine initial performance curves and efficiency just prior to the equipment entering service.

END OF SECTION 11060

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SECTION 11140 – PROCESS SUBMERSIBLE PUMPS

PART 1 - GENERAL

1.1 SCOPE

This section covers furnishing guiderail mounted, single-stage, submersible, end suction centrifugal pumping units and controls as indicated herein or on the Drawings.

Equipment Tag	Location
PUMP-1	Niagara Pump Station
PUMP-2	Niagara Pump Station
PUMP-3	Niagara Pump Station

- A. The pumping unit shall be complete with a close-coupled, submersible electric motor, and all other appurtenances specified, or otherwise required for proper operation.
- B. Each pumping unit, including motor and all integral controls, shall be rated and labeled for use in a Class 1, Division 1, Group D area as defined by the National Electric Code.
- C. Each pumping unit shall be controlled by an Adjustable Frequency Drive as specified in Section 16160.

1.2 GENERAL

Equipment furnished under this section shall be fabricated and assembled in full conformity with drawings, specifications, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Owner's Representative. Hydraulic considerations and definition of terms shall be as set forth in the Hydraulic Institute Standards.

- A. General Equipment Requirements. Section 01610 - General Equipment Requirements shall apply to all equipment furnished under this section. If requirements in this specification differ from those in the General Equipment Requirements, the requirements specified herein shall take precedence.
- B. Tagging. Each item of equipment and each part shipped separately shall be tagged and identified with indelible markings for the intended service. Tag numbers shall be clearly marked on all shipping labels and on the outside of all containers.
- C. Power Supply. Power supply to the equipment shall be 480 Vac, 3 Phase, 60 Hz.

1.4 SUBMITTALS.

- A. Drawings and Data. Complete fabrication and assembly drawings, together with detailed specifications and data covering materials, parts, devices, and accessories forming a part of the equipment furnished, shall be submitted in accordance with the Submittals section. The data and specifications for each unit shall include, but shall not be limited to, the following:

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Pumps

1. Name of manufacturer.

Type and model.

Tag number.

Pump designation.

Pump location.

Rotative speed.

Size of suction nozzle.

Size of discharge nozzle.

Net weight of pump and motor only.

Net weight with pedestal, when specified.

Complete performance curves showing capacity versus head,

NPSH required, pump efficiency, wire-to-water efficiency, and pump input power.

Data on shop painting.

Motors

Name of manufacturer.

Type and model.

Type of bearings and method of lubrication.

Rated size of motor, hp, and service factor.

Insulation class and temperature rise.

Full load rotative speed.

Efficiency at full load and rated pump condition.

Full load current.

Locked rotor current.

Moisture Detection System

Name of manufacturer.

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Type and model.

Enclosure rating and layout if an enclosure is specified.

Electrical schematics and wiring diagram.

Published descriptive data on each item of equipment and all accessories, indicating all specific characteristics and options.

Control Components

Type and manufacturer.

Model.

Enclosure rating.

Published descriptive data on all components, indicating all specific characteristics and options.

- G. Operation and Maintenance Data and Manuals. Adequate operation and maintenance information shall be supplied as required in Division 1. Operation and maintenance manuals shall be submitted in accordance with the Submittals section. The operation and maintenance manuals shall be in addition to any instructions or parts lists packed with or attached to the equipment when delivered.

1.6 QUALITY ASSURANCE.

- A. Balance. All rotating parts shall be accurately machined and shall be in as nearly perfect rotational balance as practicable. Excessive vibration shall be sufficient cause for rejection of the equipment. The mass of the unit and its distribution shall be such that resonance at normal operating speeds is avoided. In any case, the unfiltered vibration velocity, as measured at any point on the machine including top of motor, shall not exceed the maximum velocity as indicated for vertical, end suction, solids handling pumps in Figure 9.6.4.10 of the Hydraulic Institute standard.

1. At any operating speed, the ratio of rotative speed to the critical speed of a unit or its components shall be less than 0.8 or more than 1.3.

1.7 DELIVERY, STORAGE, AND HANDLING.

Shipping, handling and storage shall be in accordance with Specification Section 01612.

1.8 SPARE PARTS. Spare parts shall be provided as follows:

Part	Quantity
Mechanical seals	1
Casing wearing rings	1
Impeller wearing rings	1
Sets of motor bearings	1

Spare parts shall be suitably packaged with labels indicating the contents of each package. Spare

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parts shall be delivered to Owner's Representative as directed.

PART 2 - PRODUCTS

2.1 SERVICE CONDITIONS.

- A. The pumps will be pumping stormwater from highway and municipal street rainwater and snowmelt runoff.
- B. All equipment furnished shall be designed to meet all specified conditions and to operate satisfactorily at the elevation indicated.

2.2 PERFORMANCE AND DESIGN REQUIREMENTS. Pumping units shall be designed for the performance and design requirements as follows:

Equipment Tag	PUMP-1 PUMP-2 PUMP-3
Approximate Site Elevation	549.75
Maximum Air Temperature (°F)	115
Maximum Liquid Temperature (°F)	68
Maximum Solids Concentration, by weight	1%
Impellor Type	Non-Clog
Operating Condition	Variable Speed
Rated Head (feet WC)	33.0 ft
Capacity at Rated Head (gpm)	5,250
Speed at Rated Head (rpm)	880
Shutoff Head at Full Speed (feet WC)	69
Maximum Nominal Pump Speed (rpm)	882
Minimum Motor Size (Hp)	76
Efficiency at Rated Head (%)	75%
Tank Depth (approx) (feet)	31
Minimum Liquid Depth in Tank (feet)	8.0
Minimum NPSHA at Rated Head (feet WC)	Flooded Suction
Maximum Vibration Velocity (in/s)	HIS
Minimum Pump Discharge Nozzle / Elbow Size (inch)	12

- A. All specified conditions shall be at rated speed unless otherwise indicated.
- B. Overall (wire-to-water) efficiency for constant speed pumps shall include losses in the pump and motor. Overall (wire-to-water) efficiency for variable speed pumps shall include losses in the pump, motor, adjustable frequency drive, and any transformers supplied as part of the adjustable

frequency drive equipment.

- D. The minimum hydrostatic test pressure shall be 1.5 times shutoff head plus max suction pressure.
- E. Pump performance shall be stable and free from cavitation and noise throughout the specified operating head range at minimum suction submergences. The design running clearance between the impeller inlet and the casing wearing ring (if provided) shall be not less than 0.01 inch or 1 mil per inch of casing wearing ring diameter, whichever is greater.
- F. The system has been designed for 2 duty pumps with 1 standby pump.

2.3 MATERIALS

- A. Stator Housing, Oil Chamber Housing, Impeller Casing, and Impeller - Cast iron, ASTM A48.
- B. Casing Wearing Ring - Bronze, ASTM B62; or rubber.
- C. Bottom Wearing Plate - Cast iron, ASTM A48 with spiral grooves.
- D. Shaft - Alloy steel, hard chrome plated; or martensitic stainless steel, AISI Type 416 or 420.
- E. Mechanical Seals - Single type, oil lubricated with silicon or tungsten carbide seal rings at all points, except the upper rotating seal, which shall be carbon.
- F. Discharge Base - Cast iron or fabricated steel.
- G. Guiderrails - Stainless steel pipe, ASTM A312, Schedule 40S (minimum).
- H. Upper guiderail bracket, cable hooks, and chain hooks - AISI Type 304 stainless steel.
- I. Coatings – Epoxy.

2.4 PUMP CONSTRUCTION

- A. Impeller Casing. The impeller casing shall have well-rounded water passages and smooth interior surfaces free from cracks, porosity, blowholes, or other irregularities. The discharge nozzle shall be flanged and sufficiently rigid to support the pumping unit under all operating conditions.
- B. Impeller. The impeller shall be an enclosed or semi-open one-piece casting. The interior water passages shall have uniform sections and smooth surfaces and shall be free from cracks and porosity. The impeller shall be dynamically balanced and securely locked to the shaft by means of a key and self-locking bolt or nut.
- C. Grinder Type Pumps. The pump shall be equipped with a 316L stainless steel stationary cutter and chrome alloy cast iron rotary cutter.
- D. Wearing Rings. For pumping units 20 hp and larger, renewable wearing rings shall be provided in the casing and on the impeller. The rings shall be positively locked in place.
 - 1. For pumping units less than 20 hp a renewable wearing ring or an axially adjustable wearing plate shall be provided in the casing. Casing wearing ring shall be securely

fastened to the impeller casing front cover to provide either an axial or radial running clearance. Axially adjustable wearing plate shall be arranged to permit adjustment of the axial running clearance between the impeller and plate. The wearing plate shall have an outward spiraling groove designed to force stringy solids outward and away from the impeller.

- E. Oil Chamber Housing. The oil chamber shall contain a drain plug and a vent plug.
- F. Mechanical Seals. Each pump shall be provided with two mechanical rotating shaft seals arranged in tandem and running in an oil chamber. Each interface shall be held in contact by an independent spring system designed to withstand maximum suction submergence. The seals shall require neither maintenance nor adjustment and shall be readily accessible for inspection and replacement.
 - 1. Shaft seals lacking positively driven rotating members or conventional double mechanical seals which utilize a common single or double spring acting between the upper and lower units and requiring a pressure differential to offset external pressure and effect sealing, will not be acceptable. The seals shall not rely upon the pumped media for lubrication and shall not be damaged if the pumps are run unsubmerged for extended periods while pumping under load.
- G. Sealing of Mating Surfaces. All mating surfaces of major components shall be machined and fitted with O-rings where watertight sealing is needed. Sealing shall be accomplished by O-ring contact on four surfaces and O-ring compression in two planes, without reliance on a specific fastener torque or tension to obtain a watertight joint. The use of elliptical O-rings, gaskets, or seals requiring a specific fastener torque value to obtain and maintain compression and water tightness will not be acceptable. The use of secondary sealing compounds, gasket cement, grease, or other devices to obtain watertight joints will not be acceptable.
- H. Guiderail Mounted Base. A discharge base and discharge elbow shall be furnished by the pump manufacturer. The base shall be sufficiently rigid to firmly support the guiderails, discharge piping, and pumping unit under all operating conditions. The base shall be provided with one or more integral support legs or pads suitable for bolting to the floor of the wet well. The face of the discharge elbow inlet flange shall be perpendicular to the floor and shall make contact with the face of the pump discharge nozzle flange. The diameter and drilling of the elbow outlet flange shall conform to ANSI B16.1, Class 125.
 - 1. The pump and motor assembly shall be automatically connected to and supported by the discharge base and guiderails so that the unit can be removed from the wet well and replaced without the need for operating personnel to enter the wet well.
 - 2. Sliding Bracket. Each guiderail mounted pumping unit shall be provided with an integral, self-aligning guiderail sliding bracket. The bracket shall be designed to obtain a wedging action between flange faces as final alignment of the pump occurs in the connected position. The bracket shall maintain proper contact and a suitably sealed connection between flange faces under all operating conditions. The sliding bracket shall be nonsparking where the pump is installed in a hazardous area.
 - 3. Guiderails. Each guide rail mounted pumping unit shall be equipped with one or more guiderails. Guiderails shall be sized to fit the discharge base and the sliding bracket and shall extend upwards from the discharge base to the location indicated on the drawings.

An upper guiderail bracket shall be provided at the pump access opening.

4. Lifting Cable. Each guide rail mounted pumping unit shall be provided with a cable suitable for removing and installing. The cable shall be stainless steel. A suitable hook shall be provided at the top of the wet well.

- I. Shop Painting. All iron and steel parts which will be in contact with pumped liquid or submerged after installation, including the inside of the casing, the impeller, and the discharge elbow, shall be shop cleaned the coating manufacturer's recommendations and painted with the epoxy coating in accordance with system specified. The coating shall have a dry film thickness of at least 10 mils and shall consist of a prime (first) coat and one or more finish coats. At least 1 quart of the finish coat material shall be furnished with each pump for field touch-up.

2.5 ELECTRIC MOTORS

Each pump shall be driven by an air-filled, totally submersible electric motor provided by the pump manufacturer. Motor nameplate rating shall exceed the maximum power required by the pump in the operating head range. Each motor shall be rated for the power-supply provided to the pump, and shall have a service factor of 1.15. The stator housing shall be an air-filled, watertight casing. A cooling jacket shall encase the motor housing for each pump where needed to maintain adequate cooling. The cooling jacket shall require no external source of cooling water. Motor insulation shall be moisture resistant, Class F, 155°C. Each motor shall be NEMA Design B for continuous duty at 40°C ambient temperature, and designed for at least 10 starts per hour.

- A. The motor bearings shall be antifriction, permanently lubricated type. The lower bearing shall be fixed to carry the pump thrust and the upper bearing free to move axially. The bearings shall have a calculated AFBMA L10 Life Rating of 40,000 hours when operating at maximum operating head. Maximum shaft runout at the mechanical seals shall not exceed 2 mils at any point in the operating head range.
- B. Each motor installed in a wet pit shall be capable of continuous operation in air (unsubmerged) for at least 24 hours under pump full load conditions, without exceeding the temperature rise limits for the motor insulation system.
- C. Each pump shall be equipped with one or more multiconductor cable assemblies for power and control. Each multiconductor assembly containing power cables shall be provided with a separate grounding conductor. Each cable assembly shall bear a permanently embossed code or legend indicating the cable is UV rated and suitable for submerged use. Cable sizing shall conform to NEC requirements.
- D. All cables for wet well mounted pumps shall be of sufficient length to terminate in a junction box outside the wet well, with 10 feet of slack which will be coiled on a cable hook at the top of the wet well. Each cable shall be supported by AISI Series 300 corrosion-resistant stainless steel Kellems or woven grips to prevent damage to the cable insulation. Mounting of cable supports in the wet well shall be coordinated by Contractor to prevent damage to the cable.
- E. The cable entry water seal shall include a strain relief and a grommet type seal designed so that a specific fastener torque is not required to ensure a watertight, submersible seal. The cable entry junction box and motor shall be separated by a stator lead sealing gland or a terminal board. The junction box shall isolate the motor interior from moisture gaining access through the top of the

stator housing.

- F. Motors shall be specifically selected for service with an adjustable frequency type speed controller (see Specification 16160) and shall be derated to compensate for harmonic heating effects and reduced self-cooling capability at low speed operation so that the motor does not exceed Class B temperature rise when operating in the installed condition at load with power received from the adjustable frequency drive. All motors driven by adjustable frequency drives shall be supplied with full phase insulation on the end turns and shall meet the requirements of NEMA MG 1, Part 31. In addition to the requirements of NEMA MG 1, Part 31, motors shall be designed to be continually pulsed at the motor terminals with a voltage of 1600 volts ac.

2.6 CONTROLS.

- A. Each motor shall be protected by one motor temperature switch embedded in each phase winding. Each switch shall be designed to operate at 140°C. Each switch shall be normally closed automatic reset type rated 5 amps at 120 volts ac. The switches shall be wired in series with end leads wired to terminals within the motor housing.

Each motor housing shall be provided with a moisture detection system complete with all sensors, control power transformers, intrinsically safe control modules, and relays. The moisture detection system shall be rated for a 120 volt ac supply. The moisture detection system shall provide one normally closed dry output contact rated 5 amps at 120 volts ac. The contact shall open when moisture is detected in the motor housing. All moisture detections system components shall be furnished by the pump supplier.

PART 3 - EXECUTION

- 3.1 INSTALLATION. Each pumping unit will be installed in accordance with the Equipment Installation Section 11060.

3.2 FIELD QUALITY CONTROL.

- A. Installation Check. An experienced, competent, and authorized representative of the manufacturer shall visit the site of the Work and inspect, check, adjust if necessary, and approve the equipment installation. The representative shall be present when the equipment is placed in operation in accordance with Division 1, and shall revisit the job site as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of Owner's Representative.
- B. The manufacturer's representative shall furnish a written report certifying that the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily.
- C. Installation Supervision. The equipment manufacturer shall furnish a qualified installation supervisor during the equipment installation. All costs of these services shall be included in the contract price. The manufacturer's installation supervisor shall observe, instruct, guide and direct the contractor's installation process.

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- 3.3 STARTUP REQUIREMENTS. Startup services shall be in accordance with the Specification Section 01650 – Startup Requirements.
- 3.4 TRAINING REQUIREMENTS. Training services shall be in accordance with the Specification Section 01821 – Instruction of Operations and Maintenance Personnel.

END OF SECTION 11140

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SPECIAL CONSTRUCTION

1. DESCRIPTION:

- 1.01 Furnish all labor, materials, equipment and services necessary to complete the work as indicated on the Contract Plans and the Specification Sections listed below
- 1.04 All work shall conform to the requirements specified in Part 1 – General, of the Sections listed.

2. MATERIALS:

- 2.01 The materials shall be as specified in Part 2 – Products, of the Sections listed.

3. CONSTRUCTION DETAILS:

- 3.01 The construction details shall be as specified on Part 3 – Execution, if the Sections listed.

4. METHOD OF MEASUREMENT:

- 4.01 This item shall be measured for payment on a lump sum basis for the work completed in accordance with the Contract Documents and as directed by the Engineer.

5. BASIS OF PAYMENT:

- 5.01 Payment for this item shall be made at the lump sum bid price bid. The lump sum price bid shall include cost of furnishing all labor, material, equipment and appliances necessary to complete the work as indicated on the Contract Plans and as specified herein in the Sections listed.
- 5.02 Detailed Estimate:
 - A. Before the first certificate of payment is issued for the work under this item, submit a detailed estimate of quantities and prices for all materials, labor, and other items included under this item, which shall aggregate the contract lump sum price bid for this item. Prepare the detailed estimate in the same sequence as the Sections listed.
 - B. The detailed estimate shall be supported by such evidence, including certified copies of subcontracts, as the Engineer may require.
 - C. The detailed estimate must be approved by the Engineer who may revise it as, in his/her reasonable judgment, is necessary to make the various item conform to their true values. The value of each certificate of payment will be based on the approved detailed estimate.
- 5.03 Monthly payments will be made for this item in proportion to the total amount of work completed.

ITEM 627.0013 25**SPECIAL CONSTRUCTION****1. SPECIFICATION SUMMARY**

1.01 This Item includes the following specifications:

- A. Section 13121 Pre-Engineered Buildings
- B. Section 13500 Instrumentation and Control System
- C. Section 13530 Programmable Logic Controllers
- D. Section 13550 Software Control Block Descriptors
- E. Section 13560 Instrumentation General Requirements
- F. Section 13562 Flow Instruments
- G. Section 13563 Pressure and Level Instruments
- H. Section 13570 Panels and Appurtenances
- I. Section 13591 Fiberoptic Communication Cable and Appurtenances

1.02 This item shall include, but not be limited to, the following:

- A. Equipment and other such items specially designed and required for the controls and operations of the pumphouse upgrade system.

SECTION 13121 – PRE-ENGINEERED BUILDINGS

PART 1 GENERAL

1.1 SUMMARY

- A. The work under this section includes requirements for the manufacture of prefabricated precast concrete shelter as detailed in the plans and specified below.

1.2 DESCRIPTION OF SYSTEM

- A. Precast Concrete Shelter size (nominal exterior dimensions) shall be as follows: 24'-6" x 16'-6"
- B. Refer to the drawings for shelter layout and configuration.

1.3 SHELTER MANUFACTURER

- A. The equipment shelter manufacturer shall have been engaged in the production of pre-cast concrete shelters for a minimum of five years.
- B. Approved manufacturers include:
 - 1. Old Castle Precast – Hartford City, IN
 - 2. VFP – Roanoke, Virginia
 - 3. Lakelands Concrete Products – Lima, NY.
 - 4. Approved Equal

1.4 SHELTER DESCRIPTIONS

- A. Each shelter shall be a prefabricated precast concrete steel reinforced structure. No other type of construction material is permitted. The building exterior shall be the nominal dimensions as noted on the Drawings. The finished inside clear height shall be at least 9'-0".
- B. Roof thickness shall vary and slope away from the door. Roof shall have a pitch of 1" V / 12" H.
- C. Concrete floor shall cast in place concrete on-site as per the Drawings.

1.5 MINIMUM DESIGN REQUIREMENTS

- A. Shelters shall be designed to meet the minimum loadings as indicated on the Structural Drawings.

1.6 DESIGN CERTIFICATION

- A. Delegated Design: Shelters shall be designed by a Professional Engineer licensed in the State

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of New York. A letter of certification signed and sealed by a registered professional engineer stating the building system meets design load requirements shall be provided with the Submittals.

- B. Shelters shall be designed to meet the requirements of loading of the following:

2025 New York State Building Code

American National Standards (A.N.S.) "Building Code Requirement for Minimum Design Loads in Buildings and Other Structures."

American Concrete Institute (A.C.I.-318R-05) "Building Code Requirements for Reinforced Concrete."

Concrete Reinforcing Institute "Manual of Standard Practice."

1.7 SUBMITTALS

- A. Submit shelter manufacturer's (shop) drawings of supplied equipment shelters. Shop drawings to include the following:

Title sheet with plan index, code summary, design parameters, physical properties and finish schedule

Interior and exterior elevations noting all equipment, devices and relevant dimensions.

Ceiling plans noting all equipment, devices and relevant dimensions.

Shelter cross section, construction details and connection details

Product Data for all interior components, equipment and materials furnished with the building.

Drawings signed and sealed by a Registered Professional Engineer licensed in the State of New York. Engineer to certify the design and construction meets the minimum requirements specified herein along with all requirements of the State Building Code.

1.8 WARRANTY

- A. The shelter supplier shall warrant each shelter structure from water intrusion for a period of 10 years from substantial completion.

PART 2 PRODUCTS

2.1 MATERIALS

- A. The materials furnished shall include a precast concrete structure, fasteners, anchors, sealants, doors, and all other parts/equipment necessary for a complete building system as detailed in the plans and specifications.

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- B. Concrete shall have a 28 day strength of 5000 PSI. Building shall meet the ACI 318 Building Code requirements, or latest edition, for reinforced concrete.
- C. Air entraining admixture, conforming to ASTM C260, shall be added to produce between 5 to 9 percent air by volume.
- D. Reinforcing steel shall be in with the Concrete Reinforcing Institute Manual of standard practice. Reinforcing steel shall be in conformance with ASTM A615 grade 60 and welded wire fabric shall be ASTM A185.
- E. Building shall be leak proof and corrosion proof with a 2 hour fire rating. Wall panels shall have a natural concrete, uniform interior broom finish. Exterior shall have an exposed aggregate finish with smooth concrete bands at the corners.
- F. Roof shall slope away from the door. Roof shall have a minimum 3" overhang on all sides, and a continuous, built in drip edge. Roof edge shall have a smooth form finish.
- G. Panel-to-Panel, Panel-to-Roof and Panel-to-Floor connections shall be A36/A709-36 zinc plated steel, with a minimum dimension of 5"x5"x1/2". Washers shall be zinc plated A36 steel 3"x3"x1/4" with (1) 9/16" hole. Bolts shall be 1/2" diameter ASTM A449 Grade 5 with locking washer.
- H. Panel-to-Roof and Panel-to-Floor gasket shall be 1" wide x 1/2" thick closed cell neoprene NYSDOT 705.08
- I. Caulk all joints inside and out, caulk shall be BASF Sonolastic NP-1, color shall be Limestone.
- J. Structural Non-Composite Wythe Connectors:
 - 1. Shall be Non-Conductive, Non-corrosive, Fiber-composite connectors, having a tensile strength of 120,000 psi, minimum glass content of 76 percent by weight, and a coefficient of thermal expansion of 5×10^{-6} in/in/ °F, nominal.
 - 2. ICC-ES Evaluation Service Report based on data submitted in accordance with ICC-ES Acceptance Criteria 320 indicating compliance with the applicable building code.
- K. DOW ® Extruded Polystyrene Board Insulation: Complying with ASTM C578, Type IV; with regular spaced holes identifying connector placement locations.
- L. Doors: As per Specification Section 08110. Size: See A Drawings.
- M. Door Hardware: As per Specification Section 08700.
- N. Electrical Systems: As per the E Drawings.
- O. Lighting: As per the E Drawings.
- P. Ventilation Fans and Louvers: As per the H Drawings.

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PART 3 EXECUTION

3.1 SHELTER INSTALLATION

- A. Allow shelter foundation to adequately cure prior to setting shelter. Shelter foundation installer shall provide concrete break strength reports to document concrete has achieved design strength requirements prior to installation.
- B. Install shelter per manufacturer's recommendations including tie downs, door canopy and ice shields. Align structure to match conduit stubs.
- C. Field install any other equipment and devices not furnished within the prefabricated structure which are required as part of the project.

END OF SECTION 13121

SECTION 13500 - INSTRUMENTATION AND CONTROL SYSTEM

PART 1 - GENERAL

- 1.1 SCOPE. This section covers the furnishing and installation of a Plant Control System (PCS). The system shall be furnished as specified, complete with all software, processors, operator interface terminal (OIT) hardware, input/output hardware, instrumentation, and all devices, accessories, appurtenances, testing, and training necessary for proper operation. The SYSTEM SUPPLIER shall provide coordination services to support peer-to-peer PLC communications with the other vendor supplied PLCs.

The terms "HMI" and "OIT" is used interchangeably and shall mean the OIT touchscreen to be provided under this Contract as part of LCP-1.

- A. The Plant Control System generally consists of, but is not limited to, the follow components:

The SYSTEM SUPPLIER shall provide system configuration services for the Allen Bradley PLC system software located in the Niagara Pump Station Panel LCP-Niagara. The SYSTEM SUPPLIER shall configure the system with the current version of the software utilized by OWNER during the configuration process. The SYSTEM SUPPLIER shall also provide configuration services for historical collection of data points on the existing historical collection software as necessary or as directed by OWNER'S REPRESENTATIVE.

The SYSTEM SUPPLIER shall provide system configuration services for the PLC including OIT graphics displays, data logging and alarm messages, all associated hardware, software and programming for all devices and systems shown on the Instrumentation ("I") Drawings and described in Specification Section 13550 - Software Control Block Descriptions.

The Plant Control System (PCS) as provided under this specification section, utilizes an Allen Bradley CompactLogix PLC and communicates over an Ethernet network using Ethernet / IP.

The specified OIT shall be capable of hosting a web page that will duplicate all the functions and screens available at the OIT via internet connection. The SYSTEM SUPPLIER shall configure this functionality. The SYSTEM SUPPLIER shall provide services to coordinate the interface of this new Ethernet connection (the OIT) with the campus staff responsible for controlling access to the Owner's network.

The specified OIT shall also capable of sending email and SMS text messages to 5 email addresses / phone numbers simultaneously upon the triggering of any of the alarm conditions specified herein. The email message and text message shall include the description of the alarm. The SYSTEM SUPPLIER shall configure this functionality.

The SYSTEM SUPPLIER shall coordinate with the Owner's staff to obtain system access to the Owner's existing wide area network.

- B. Associated Sections. This section also includes the equipment and services specified in the following sections.

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1. Section 13530 - Programmable Logic Controllers
 2. Section 13550 - Software Control Block Descriptions
 3. Section 13560 - Instrumentation - General Requirements
 4. Section 13562 - Flow Instruments
 5. Section 13563 - Pressure and Level Instruments
 6. Section 13570 - Panels and Appurtenances
 7. Section 13591 – Fiber Optic Communications Cable and Appurtenances
- 1.3 GENERAL. Equipment furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the drawings, specifications, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by OWNER'S REPRESENTATIVE.
- A. General Equipment Requirements. The supplier shall have as a minimum 5 years in the design, coordination and supply of computer-based monitoring, control, and data acquisition systems.
 - B. Drawings. The Drawings indicate locations and arrangements of equipment and include input/output lists and block and one-line diagrams showing connections and interfaces with other equipment. The input/output (I/O) lists are included on the Instrumentation Drawings.
 - C. Codes, Permits and Agency Approvals. All work performed and all materials used shall be in accordance with the National Electrical Code, and with applicable local regulations and ordinances. Where mandated by codes, panels, assemblies, materials, and equipment shall be listed by Underwriters' Laboratories.
 - D. SYSTEM SUPPLIER. The CONTRACTOR shall provide the services of a single manufacturer or supplier, hereinafter referred to as the SYSTEM SUPPLIER to design, coordinate, and supply all Equipment and software furnished under this section and under other Associated Sections listed in the Scope paragraph above. The SYSTEM SUPPLIER shall be regularly engaged in the business of supplying computer-based monitoring, control, and data acquisition systems. The CONTRACTOR shall utilize the services of the SYSTEM SUPPLIER to coordinate all control system related items, to check and calibrate instruments, and to perform all testing, training, and startup activities specified. The SYSTEM SUPPLIER shall have the following minimum qualifications: The supplier shall maintain a design office staffed with qualified technical design personnel. The supplier shall maintain competent and experienced service personnel to service the hardware and software furnished for this project.
 - E. Coordination. Systems supplied under this section shall be designed and coordinated by SYSTEM SUPPLIER for proper operation with related equipment and materials furnished by other suppliers under other sections of these specifications, under other contracts, and, where applicable, with related existing equipment. All equipment shall be designed and installed in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the manufacturer, and the manufacturer of the related equipment.
 - F. Related Equipment and Materials. Related equipment and materials may include, but will not be

limited to, instrumentation, motor controllers, valve actuators, chemical feeders, analytical measuring devices, conduit, cable, and piping as described in other sections or furnished under other contracts.

- 1.4 GENERAL REQUIREMENTS. The drawings and specifications indicate the extent and general arrangement of the systems. If any departures from the drawings or specifications are deemed necessary by SYSTEM SUPPLIER, details of such departures and the reasons shall be submitted to OWNER'S REPRESENTATIVE for review with or before the first stage submittal. No departures shall be made without prior written acceptance.

The specifications describe the minimum requirements for hardware and software. Where SYSTEM SUPPLIER'S standard configuration includes additional items of equipment or software features not specifically described herein, such equipment or features shall be furnished as a part of the system and shall be warranted as specified herein.

- A. Governing Standards. Equipment furnished under this section shall be designed, constructed, and tested in accordance with IEEE 519, ANSI C37.90, FCC Part 15 - Class A, and NEMA ICS-1-109.60.
- B. Dimensional Restrictions. Layout dimensions will vary between manufacturers and the layout area indicated on the drawings is based on typical values. The SYSTEM SUPPLIER shall review the contract drawings, the manufacturer's layout drawings and installation requirements, and make any modifications requisite for proper installation subject to acceptance by OWNER'S REPRESENTATIVE. At least three feet of clear access space shall be provided in front of all components of the instrumentation and control system components.
- C. Workmanship and Materials. SYSTEM SUPPLIER shall guarantee all equipment against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, and leakage, breakage, or other failure. Materials shall be suitable for service conditions.

All equipment shall be designed, fabricated, and assembled in accordance with recognized and acceptable engineering and shop practice. Individual parts shall be manufactured to standard sizes and thicknesses so that repair parts, furnished at any time, can be installed in the field. Like parts of duplicate units shall be interchangeable. Equipment shall not have been in service at any time prior to delivery, except for testing.

- D. Abbreviations. Reference to standards and organizations in the Specifications shall be by the following abbreviated letter designations:
 - 1. ANSI - American National Standards Institute
 - 2. ASTM - American Society for Testing and Materials
 - 3. AWG - American Wire Gage
 - 4. FCC - Federal Communications Commission
 - 5. IEEE - Institute of Electrical and Electronics Engineers
 - 6. ISA - Instrumentation, Systems and Automation (Society)

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7. NEC - National Electrical Code
 8. NEMA - National Electrical Manufacturers Association
 9. UL - Underwriters' Laboratories
- 1.5 SUBMITTALS. Complete dimensional, assembly, and installation drawings, wiring and schematic diagrams; and details, specifications, and data covering the materials used and the parts, devices and accessories forming a part of the system furnished, shall be submitted in accordance with the submittals section. Submittal data shall be grouped and submitted in three separate stages. The submittal for each stage shall be substantially complete. Individual drawings and data sheets submitted at random intervals shall not be accepted for review. Equipment tag numbers or identifications used on the drawings shall be referenced where applicable.
- A. Hardware.
1. A detailed list of any exceptions, functional differences, or discrepancies between the system proposed by SYSTEM SUPPLIER and this specification.
 2. Product catalog cut sheets on all hardware items, clearly marked to show the model number, optional features, and intended service of each device.
 3. A brief, concise description of the proposed system, including major hardware and software components, field services, and personnel training.
 4. A block diagram or schematic drawing showing the principal items of equipment furnished, including model numbers, and their interrelationships.
 5. Environmental and power requirements, including heat release information for each equipment item.
 6. Standard field termination drawings for all process input/output equipment, showing typical terminations for each type of point available in the system.
 7. Complete panel fabrication drawings and details of panel wiring, piping, and painting. Panel and subpanel drawings shall include overall dimensions, metal thickness, door swing, mounting details, weight, and front of panel arrangement to show general appearance, with spacing and mounting height of instruments and control devices.
 8. Wiring and installation drawings for all interconnecting wiring between components of the system and between related equipment and the equipment furnished under this section. Wiring diagrams shall show complete circuits and indicate all connections. If panel terminal designations, inter-device connections, device features and options, or other features are modified during the fabrication or factory testing, revised drawings shall be submitted before shipment of the equipment to the site.
 9. Input/output listings showing point names, numbers, and addresses. Input/output identification numbers from the contract documents shall be cross-referenced in this submittal.

- B. Operations and Maintenance Manuals. Complete system documentation, in the form of Operation and Maintenance Manuals, shall be submitted before the commencement of field acceptance testing. Operation and Maintenance Manuals shall include complete instruction books for each item of equipment furnished. Where instruction booklets cover more than one specific model or range of device, product data sheets shall be included which indicate the device model number and other special features. A complete set of "as-built" wiring, fabrication, and interconnection drawings shall be included with the manuals. If field-wiring modifications are made after these drawings are submitted, the affected drawings shall be revised and resubmitted.
- C. Training. Proposed lesson plans or outlines for all training courses specified herein, including schedule, instructors' qualifications and experience, and recommended prerequisites.

D. Programming.

- 1. Configuration Standards and Conventions. A "Software Configuration Standards and Conventions" document shall be prepared and submitted by the SYSTEM SUPPLIER. The document shall be submitted for review and approval before software configuration commences. The document shall describe and define such items as proposed graphic display process line colors/representations; color standards for "on", "off", "opened", "closed", and "alarm" conditions; alarm handling conventions; how items will be selected for control; methods for navigation between displays; address usage/naming conventions; and security setup.

Before submitting the initial draft document, the SYSTEM SUPPLIER shall meet with the OWNER'S REPRESENTATIVE and/or OWNER to review any of the Owner's existing standards and conventions.

All copies of this submittal shall be provided in color to insure the accuracy of each item. No black and white copies will be accepted. The colors used in the printed submittal shall accurately depict the colors and shapes proposed for use on the final system.

In addition to submitting the document for review, an updated version of the document shall be submitted as part of the O&M Manuals. The document shall be revised to document any additional standards that are established throughout the configuration process.

- 2. Configuration Review Meetings. Proposed graphic screens and report formats shall be reviewed with the OWNER and OWNER'S REPRESENTATIVE throughout the configuration process. The SYSTEM SUPPLIER's programming personnel shall attend the initial review meeting.

A second review meeting, held at approximately 50 percent completion, but prior to the factory acceptance test, shall also be held. Both meetings shall be held at the OWNER's facilities.

- 1.6 PREPARATION FOR SHIPMENT. All electronic equipment and instruments shall be suitably packaged to facilitate handling and to protect against damage during transit and storage. All equipment shall be boxed, crated, or otherwise completely enclosed and protected during shipment, handling, and storage. All equipment shall be protected from exposure to the elements, shall be kept dry at all times, and shall not be exposed to adverse ambient conditions.

Painted surfaces shall be protected against impact, abrasion, discoloration, and other damage. Painted surfaces that are damaged prior to acceptance of equipment shall be repainted to the satisfaction of OWNER'S REPRESENTATIVE.

Each shipment shall include an appropriate shipping list that indicates the contents of the package, including the specific instrument tags. The shipping list shall be accessible without exposing the instruments to the atmosphere. The shipping list shall also contain any cautionary notes regarding storage of the instruments, including requirements to protect the instrument from static discharge, desensitizing chemicals (solvents, paints, etc.), or ambient atmospheric conditions.

Individual instruments shall be appropriately tagged or labeled to positively identify the device. All identification shall be visible without the need to unpack the instrument from its protective packaging.

Instrument shipment and storage requirements shall be coordinated with OWNER'S REPRESENTATIVE or OWNER prior to shipment. SYSTEM SUPPLIER shall provide adequate storage and be ready to accept the shipment before shipping any equipment to the site. Additional shipping and storage requirements shall be as detailed in the individual instrument specifications.

Components that are shipped loose due to transportation limitations shall be assembled and disassembled by the manufacturer prior to shipment to assure that all components fit together and are adequately supported.

- 1.7 DELIVERY, STORAGE, AND SHIPPING. Shipping, handling and storage shall be in accordance with the requirements of Division 1.
- 1.8 SPARE PARTS. Spare parts and consumable items are specified in other Specification Sections.
 - A. Packaging. All spare parts shall be delivered to OWNER before final acceptance of the system. Packaging of spare parts shall provide protection against dust and moisture and shall be suitable for storage. Circuit boards and other electronic parts shall be enclosed in anti-static material. All packages shall be clearly marked with the manufacturer's name, part number or other identification, date of manufacture, and approximate shelf life.
 - B. Replacement. SYSTEM SUPPLIER may utilize spare parts and supplies during system installation, de-bugging, startup, or training, but shall restore all such materials and supplies to the specified quantities before final acceptance of the systems.

PART 2 - PRODUCTS

- 2.1 GENERAL REQUIREMENTS. All equipment furnished under each section referenced in SCOPE is a part of this section and shall be selected by SYSTEM SUPPLIER for its superior quality and intended performance. Equipment and materials used shall be subject to review.
- A. Standard Products. The systems furnished shall be standard products. Where two or more units of the same type of equipment are supplied, they shall be the products of the same manufacturer; however, all components of the systems furnished hereunder need not be the products of one manufacturer unless specified herein.
 - B. Panel equipment and materials shall comply with the requirements of Specification Section 13570 – Panel and Appurtenances.
- 2.2 SOFTWARE DOCUMENTATION. SYSTEM SUPPLIER shall furnish complete documentation on all software supplied with the systems specified herein. Operating systems, compilers, assemblers, and utility and diagnostic programs that are standard commercial products of third parties need not be included in the magnetic media backup. Software documentation shall consist of the following principal items.
- A. One backup set of any integrated circuit or solid-state memory-based plug-in firmware used.
 - B. Two complete backup copies of system and application software in executable format on magnetic media compatible with the system furnished.
 - C. Three sets of user reference manuals for all standard system and application software.
 - D. One set of user reference manuals for all operating system software.
 - E. Three sets of printed as-built reference documentation for any special software provided specifically for this contract.
 - F. For each licensed software product, all documentation provided by the product manufacturer shall be provided. This includes all reference manuals and any other documents that were provided by the manufacturer. There should be one set of this documentation for each piece of equipment provided. Multiple pieces of similar equipment or software require multiple copies of this documentation.
- 2.3 SOFTWARE LICENSE. All software programs supplied as a standard part of SYSTEM SUPPLIER'S products for this project shall be licensed to OWNER for use on the system specified herein. Such license shall not restrict OWNER from using the software on the system provided hereunder or its replacement. OWNER shall have the right to make copies of the software for use on the system provided. Specific requirements of SYSTEM SUPPLIER'S software license are subject to review and approval by OWNER and OWNER'S REPRESENTATIVE.
- 2.4 INSTALLATION TEST EQUIPMENT. All necessary testing equipment for calibration and checking of system components shall be provided by SYSTEM SUPPLIER. SYSTEM SUPPLIER shall also furnish calibration and maintenance records for all testing and calibration equipment used on the site if requested by OWNER'S REPRESENTATIVE.

PART 3 - EXECUTION

- 3.1 INSTALLATION REQUIREMENTS. The installation of equipment furnished hereunder shall be by the CONTRACTOR or their assigned subcontractors.
- A. Field Wiring. Field wiring materials and installation shall be in accordance with the electrical section.
 - B. Instrument Installation. Additional requirements for mounting, piping, and calibration of field instruments are described in the instrumentation section.
- 3.2 SYSTEM SOFTWARE CONFIGURATION. System software shall be configured by the SYSTEM SUPPLIER. Configuration services shall consist of the creation of the system database, report formats, operator interface graphic and tabular display screen formats, password and security implementation, and programming of control units to provide a fully functioning system. The SYSTEM SUPPLIER shall fully configure the system using data provided herein or supplied by the OWNER'S REPRESENTATIVE and/or the OWNER after award of the contract.

The system that is delivered to the field for installation, checkout, and startup shall have all files, or databases, that are configurable in size, be sized in a manner in which there will be a 50% available space available for future work after the completion of this project. This sizing should include the addition of memory modules, disk drives, or any other device to insure the 50% spare space availability. All "tuning" of software that is dependent on space requirements shall be done prior to the completion of this project.

Tuning of software programs shall be accomplished in such a manner that the program operates at its highest performance level. These programs include, but are not limited to Microsoft SQL Server, all PLC ladder logic, and others.

- A. Control System Database. The control system database shall be developed and configured by the SYSTEM SUPPLIER. The SYSTEM SUPPLIER shall enter information obtainable from the Contract Documents into the database prior to soliciting input from the OWNER'S REPRESENTATIVE and the OWNER. The SYSTEM SUPPLIER shall determine the need for any "pseudo" database points and shall ascertain and enter all information needed to define these points. The SYSTEM SUPPLIER is responsible for entering all information associated with each point. This includes but is not limited to, descriptions, engineering units, associated displays, areas, security, etc. All fields associated with each database point must be completely filled out accurately.
- B. Graphic Screen Displays. The SYSTEM SUPPLIER shall be responsible for developing and configuring the custom graphic HMI and OIT displays. Each piece of major process equipment that is monitored by the control system shall be displayed on one or more graphic screen. Graphic screens shall be representations of the equipment and piping. The screens must accurately show all devices and equipment that is part of the control loops. These items must be done in accordance to the Configuration Standards and Conventions as described later in this Section. The requirement for alarm and/or event displays shall also be provided and proven functional prior to acceptance of the system. A means of capturing and printing of all graphic screens shall also be included. The software program provided must be capable of printing the screen in a

black and white (using gray scale) or color format. This program must be accessible from all terminals provided under this contract. The black and white printing shall be done in a manner in which the use of the black background is not represented in the printout. This is done to keep the utilization of ink cartridge and toner cartridge to a minimum.

The following screens shall be provided or revised, as a minimum.

Main Overview of Pump Station.

Alarm Summary.

Event Summary.

Overview of each major process area (with vectoring to sub-areas).

- C. Software Functional Requirements. General functional requirements for system configuration are indicated on the drawings and described in the specifications. The information presented herein and indicated on the Drawings illustrates the general functional intent of the system, and may not be sufficient to fully configure the system. The SYSTEM SUPPLIER shall be responsible for determining what additional information may be required to complete the configuration tasks, and for obtaining this information from the OWNER'S REPRESENTATIVE or the OWNER.
- 3.3 SYSTEM CHECK. SYSTEM SUPPLIER shall provide the services of a field manager and a trained and experienced field supervisor to assist the installation contractor during installation, and to calibrate, test, and advise others of the procedures for installation, adjustment, and operation.
- A. Field Inspection at Delivery. The field supervisor shall inspect major equipment items within five working days of delivery, to assure that the equipment was not damaged during shipment and shall supervise or assist with unpacking, initial placement, and initial wiring of the system.
 - B. Field Inspection Prior to Start Up. After installation and wiring connections are complete, the field supervisor, with additional SYSTEM SUPPLIER's personnel for one 8 hour day, shall verify that each external connection to the system is correctly wired and field process components and devices are functioning as intended.
 - 1. Analog Signals. Analog input signals shall be simulated at the transmitting source, and verified that the correct value is being received at the proper register address in the control system. Analog outputs shall be generated at the control system, and verified to be received with the correct polarity, at the respective receiving device.
 - 2. Discrete Signals. Discrete input and output signals shall be simulated and verified that they are received at the respective receiving device, and at the proper voltage.
 - 3. Devices by Other Suppliers. If interrelated devices furnished by other suppliers or under other contracts, such as valve actuators, motor controls, chemical feeders, and instruments, do not perform properly at the time of system checkout, the field supervisor shall use suitable test equipment to introduce simulated signals to and/or measure signals from these devices to locate the sources of trouble or malfunction.

4. System Check Out Report. The SYSTEM SUPPLIER shall submit a written report on the results of such tests to OWNER'S REPRESENTATIVE. Additional documentation shall be furnished as requested by OWNER'S REPRESENTATIVE to establish responsibility for corrective measures. SYSTEM SUPPLIER shall verify, in writing, to OWNER'S REPRESENTATIVE or OWNER that SYSTEM SUPPLIER has successfully completed the external connection check before beginning system startup or field acceptance testing.

- C. Start Up Assistance. After the field supervisor has completed the system check and submitted his report, SYSTEM SUPPLIER shall supply a factory-trained engineer and a programmer to provide onsite start up assistance for two 8-hour days. During the startup period, these personnel shall thoroughly check all equipment, correct any deficiencies, and verify the proper operation of all components.

3.4 TESTING. The system shall be acceptance tested at the factory and on site.

System Supplier shall prepare a testing procedure to be approved by the Owner's Representative that shall demonstrate that the system conforms to the specifications. The testing procedure shall be submitted at least 30 days in advance of testing. The testing shall be conducted by System Supplier and witnessed by the Owner's Representative.

System Supplier shall notify the Owner's Representative in writing at least 14 days before the proposed testing date. If the factory acceptance test is concluded unsuccessfully, the test shall be repeated. System Supplier shall reimburse Owner for all expenses incurred in connection with attending repeated factory or site testing necessitated by system failure or inadequate preparation.

- A. Factory Acceptance Testing. After system assembly and debugging at System Supplier's facility, the system shall be tested before the system is shipped to the site. The factory test shall be conducted on at least the minimum system consisting of computer hardware, software, printer, and one field I/O device.

The system, including peripherals and associated software, shall be factory tested under simulated operating conditions. Both normal operating sequences and fault conditions shall be simulated. The results shall be noted on the CRT displays and the logging printer for hard copy. The testing procedures for hardware and software are described below.

All basic functions shall be demonstrated, including I/O processing, communications, alarm handling, HMI display functions, alarm logging, report generation, and historical data storage, as well as the specific functions listed herein. The system shall operate continuously for at least 72 hours without faults. This operational test may run concurrently with the demonstration of hardware and software functions. The test procedure shall also include at a least four-hour period for discretionary tests to be conducted by Owner.

For systems with software configuration by Engineer/Owner, a preliminary version of such configured software may be used as part of the factory acceptance test.

1. Hardware Test. Processors, processor modules, and peripheral devices associated with the system shall be assembled together as they will be installed in the field and shall be tested. The test shall demonstrate proper operation of each hardware device and communications among devices, and shall include verification of selected analog and discrete inputs and outputs.

2. Software Test. All system software modules specified herein shall be demonstrated. Software tests shall include running all diagnostics, debugging routines, and system test routines. The operating system, advanced process control language compiler, and all associated drivers shall be fully tested and operable for the system test. Software "patches" or changes to bypass failed or flawed modules during the test will not be acceptable.

- B. Site Acceptance Testing. After installation and checkout by System Supplier's personnel, the system shall be subjected to an acceptance test. Site acceptance testing shall be scheduled after receipt of the System Check Report and System Supplier shall verify that all field signal changes are reflected in the proper address locations in the system database.

The site acceptance testing shall follow the same procedure as the factory testing and shall operate without loss of basic functions. The number of working days of continuous operation for the test shall be 15. The operational demonstration shall confirm that the status, alarm, and process variable signals are valid and are being updated appropriately, and that the discrete and analog output signals from the control system are being correctly transmitted and implemented. Any errors or abnormal occurrences shall be recorded by System Supplier's field representative. System Supplier's field representative need not be continuously present during the site acceptance testing, but shall be available to respond to the site within one hour of notification. The representative shall inspect the system for faults at least once every 24 hours and shall log or record any noted problems. The log shall include a description of the problem, its apparent cause, and any corrective action taken.

1. Failure of Redundant Equipment. Failure of redundant equipment shall not be considered downtime provided that automatic failover occurs as specified and, in the opinion of Engineer, the failure was not caused by deficiency in design or installation. In the event of repeated failure of any hardware component or software module, the acceptance test shall be terminated and re-started.
2. Completion of Test. Successful completion of the site acceptance test, including the operational demonstration, is prerequisite to Project Completion

- 3.5 TRAINING. SYSTEM SUPPLIER shall conduct training courses for personnel selected by OWNER. Two categories of training, instrument, operator (post-installation) shall be provided. Training shall be conducted by experienced instructors who are familiar with the specific system supplied.

- A. General Training Requirements. In general, SYSTEM SUPPLIER'S standard training courses may be used to meet the training objectives specified. Where standard courses do not meet these objectives, additional coursework shall be developed. Clock hour requirements for each level of training are indicated below. A "clock hour" is defined as one hour of instruction or supervised training exercise. Training hour requirements noted are the number of hours of training to be provided for each student. Additional training time shall be provided if considered necessary to meet the training objectives.

1. Training Costs. All costs associated with the training program; including travel, lodging, shall be the responsibility of SYSTEM SUPPLIER and shall be included in the contract price.
2. Lessons. Training lesson plans and other information for the second stage submittal

as defined herein shall be submitted at least 30 days prior to the start of training.

3. Video Recording. All training sessions shall be video recorded by the System Supplier for Owner's future use in training other personnel. Video-recorded sessions shall be saved to DVD/R media for delivery to Owner. Prerecorded videos of System Supplier's standard training programs may be substituted if they cover the same topics and are developed for the same versions of hardware and software. Furnishing videos of standard training programs shall not relieve System Supplier from any of the training requirements specified herein.
- B. Instrument Training. Training on the calibration, maintenance, troubleshooting, and repair for the instrument devices provided under this project shall be provided. Training shall be conducted at the OWNER'S facilities. Training shall also be provided for any hand-held or computer-based calibration devices and their associated software.
- C. Operator Training. OWNER'S personnel will utilize the system for day-to-day monitoring and/or control of the facilities. The training program shall provide operators with sufficient knowledge to move from screen to screen within the system, understand the contents of group and detailed point displays, react to and acknowledge alarms, adjust control set points and alarm limits, configure and print shift reports, print preconfigured reports on demand, control equipment connected to the system, and react to and resolve minor system errors.
1. Classes. Post-installation Session. The post-installation training shall consist of one 4 hour day of instruction. The post-installation sessions may have to be conducted outside normal working hours to accommodate the working schedule of OWNER'S personnel. The post-installation training sessions shall be conducted for six (6) of OWNER'S operating personnel.
 2. Content of Classes. Each session shall cover at least the following topics.

Power-up, "bootstrapping", and shutdown of all hardware devices.

Logging on and off the system and the use of passwords.

Access and interpretation of standard displays and diagnostics.

Use and care of operator workstations, servers, video displays, printers, and other control room hardware, including replenishment of supplies and replacement of ribbons and ink cartridges.

Moving from screen to screen within the graphic display environment.

Interpretation of preconfigured group and detailed point or database displays.

Response to and of acknowledgment of alarms.

Adjustment of control set points and alarm limits.

Control of field equipment and devices connected to the system.

Manual entries to database points.

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Generation of current (real-time) and historical custom and predefined reports and trend displays.

Appropriate responses to software and hardware errors.

Enabling and disabling individual inputs and outputs.

3. The operator-training program shall be developed for personnel with no prior computer experience.

END OF SECTION 13500

SECTION 13530 - PROGRAMMABLE LOGIC CONTROLLERS

PART 1 - GENERAL

- 1.1 SCOPE. This section covers programmable logic controllers (PLCs) as designated, including associated input/output hardware to control process equipment and serve as the interface to field devices. The Owner has standardized on Allen Bradley PLCs, software, and accessories and no alternates will be accepted.
- A. Control System. Section 13500 shall apply to all equipment furnished under this Section.
- 1.2 GENERAL. Equipment furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the Drawings, Specifications, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by OWNER'S REPRESENTATIVE.
- A. General Equipment Requirements. Section 01610 - General Equipment Requirements section shall apply to all equipment provided under this section.
- B. Drawings. Supplementing this section, the drawings indicate the number and sizes of PLCs, locations of PLCs, and provide diagrams and schematics regarding connection and interaction with other equipment. All hardware, including power supplies, special cables, and other appurtenant equipment, shall be provided to meet the functional requirements described herein and indicated on the Drawings.
- C. I/O List. An input/output (I/O) field device signal listing is included on the Instrumentation Drawings.
- 1.3 SUBMITTALS
- A. A detailed list of any exceptions, functional differences, or discrepancies between the system proposed by SYSTEM SUPPLIER and this specification.
- B. Product catalog cut sheets on all hardware items, clearly marked to show the model number, optional features, and intended service of each device.
- C. Standard field termination drawings for all process input/output equipment, showing typical terminations for each type of point available in the system.
- D. Complete panel fabrication drawings and details of panel wiring, piping, and painting. Panel and subpanel drawings shall include overall dimensions, metal thickness, door swing, mounting details, weight, and front of panel arrangement to show general appearance, with spacing and mounting height of instruments and control devices.
- E. Wiring and installation drawings for all interconnecting wiring between components of the system and between related equipment and the equipment furnished under this section. Wiring diagrams shall show complete circuits and indicate all connections. If panel terminal designations, inter-device connections, device features and options, or other features are modified

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during the fabrication or factory testing, revised drawings shall be submitted before shipment of the equipment to the site.

- F. Review of drawings submitted prior to the final determination of related equipment shall not relieve SYSTEM SUPPLIER from supplying systems in full compliance with the specific requirements of the related equipment.
 - G. Input/output listings showing point names, numbers, and addresses. Input/output identification numbers from the contract documents shall be cross-referenced in this submittal.
- 1.4 DELIVERY, STORAGE, AND SHIPPING. Delivery, storage and shipping shall be as required in Section 13500.
- 1.5 SPARE PARTS. One spare processor module of each type, one spare power supply module of each type, two spare I/O cards of each type, and one spare communications module of each type shall be supplied.

PART 2 - PRODUCTS

- 2.1 GENERAL. All equipment furnished under this section shall be expressly selected by SYSTEM SUPPLIER for its superior quality for the intended purpose and shall comply with the following requirements.
- A. Interchangeability. All programmable logic controller systems shall be products of the same manufacturer and of the same series or product line. Processors, local and remote input/output hardware, communications modules, and specialty modules such as coprocessors and ASCII modules shall be interchangeable among all I/O panels and systems. PLC modules and hardware by other manufacturers will be acceptable only if the PLC manufacturer does not offer suitable modules and hardware for the same functions.
 - B. Initial, Spare, and Future Memory (RAM). SYSTEM SUPPLIER shall provide adequate memory for the amount of I/O, control algorithms, and communications in the initial system. Each programmable logic controller shall include provisions for future expansion and shall have 100 percent spare memory capacity and 100 percent spare data capacity installed. The spare memory capacity shall be documented by submitting to OWNER'S REPRESENTATIVE, during factory testing, a statement indicating the amounts of memory of all types being utilized and the total amount available in each system. The statement shall include an estimate of the total program and data memory necessary, including spare memory, based on the I/O hardware for the system, and previous programming experience.
 - C. Spare I/O. Each PLC input/output enclosure shall be provided with at least 20 percent spare inputs and outputs of each type. Spare I/O shall be installed, wired, and interfaced properly to the terminal strip. The spare I/O shall be in addition to any I/O installed and reserved for future process signals as may be indicated on the I/O list. In addition, each PLC input/output enclosure shall be capable of accommodating 25 percent of additional input/output capacity of each type as originally assembled, without the need for additional expansion racks, communication adapters, cables, or PLC power supplies.
 - D. Expandability. Each PLC processor and associated I/O shall have a future expandability of at

least 50 percent of the provided system, whichever is greater.

- E. **Signal Power Supplies.** A regulated dc power supply for analog input loops shall be provided for each I/O rack. Power supplies shall be suitable for an input voltage variation of ± 10 percent, and the supply output shall be fused or protected against short-circuiting. Output voltage regulation shall be as required by the instrumentation equipment supplied under another section. The loop power supply shall be separate from the power supply circuit for the processor and racks. A separately fused 120 volts ac and 24 volts dc power source shall be provided for all digital inputs from field devices. Unless otherwise noted, all field devices will be provided with dry contacts that close to provide an input to the PLC.
 - F. **Appurtenances.** The PLC processor and I/O hardware shall be provided as complete systems, as shown on the block diagram drawings. The PLCs shall include all necessary hardware and software for a complete working system. All special rack or panel mounted power supplies, special interconnecting and programming cables, special grounding hardware, or isolation devices shall be furnished as required for proper operation of the equipment. Signal converters, signal boosters, amplifiers, special power supplies, special cable, special grounding, intrinsically safe relays and current repeaters, surge suppression devices, and isolation devices shall be furnished and installed as required for proper operation of the equipment.
- 2.2 **PLC PROCESSOR.** The programmable logic controller processor shall be an industrial type that utilizes battery-backed CMOS type or nonvolatile type memory. Battery-backed memory shall include integral batteries with sufficient capacity for at least 6 months' memory retention without power to the processing unit. Standby and shelf life of the batteries shall be at least 5 years.

PLC processors shall be the Allen-Bradley CompactLogix without exception.

- A. **Diagnostics.** The processor shall utilize self-monitoring diagnostic techniques. Easily visible LEDs shall indicate "run" and "halt" status as well as memory and input/output error conditions. Diagnostic codes shall also be available through the programming device to facilitate troubleshooting.
- B. **Programming Port.** The processor shall include a programming port that is available for programming and monitoring on-line after the system is fully functional. Removal or disruption of network communications, remote I/O communications, or HMIs to permit programming and monitoring will not be acceptable.
- C. **Communications.** The processor shall be programmed to operate autonomously, regardless of communications status with other units.
- D. **Environment.** The processor shall be suitable for operation in the environments specified in another section. A key switch shall be provided on the processor to select the operating mode and as a security measure.
- E. **Programming.** The processor shall be programmable using conventional relay ladder logic, or as required, and shall include the following functions and features.

Contacts, coils, branching.

Data comparisons.

On-delay and off-delay timers.

Counters with comparators.

Floating Point Math and Logical instructions.

Master control relay.

Transitional or one-shot outputs.

Standard and user-defined data tables for digital and analog value storage.

- F. Capabilities. The processor shall include the following capabilities for programming, debug of programs, and troubleshooting.

Off-line programming.

On-line status of coils and registers.

Input/output forcing.

- G. Configuration. Processors shall be configured for standard rack mounting and shall be of plug-in printed circuit board construction. Each programmable logic controller shall include integral communications ports for the programming device, remote input/output, HMI device, or remote communications interfaces as required.

Programmable logic controller systems shall support the following types of input/output.

120 volt ac digital input and output.

4-20 mA dc analog input and output.

- H. Input/Output Hardware. Input/output hardware shall be supplied in standard modules of 4, 8, or 16 points each for assembly in local and remote input/output enclosures.

All input/output hardware shall be entirely contained within the PLC enclosure.

Programmable logic controllers having fixed, non-removable input/output hardware are acceptable.

All digital input/output hardware shall include isolation against surges of at least 1500 volts. All output hardware connected to inductive loads shall be supplied with surge suppression devices as required and recommended by the PLC manufacturer to prevent damage to output hardware. Combination input/output modules will be acceptable if they meet all of the requirements in the following subparagraphs.

1. Wiring Terminals. All input/output modules shall utilize easily removable plug-in or hinged field wiring terminals to allow removal of modules without disconnecting individual wires.
2. I/O Circuit Power Supply. Outputs for motor driven equipment will typically be

powered from the driven equipment. Digital outputs for miscellaneous equipment shall be powered either from the controlled equipment or the PLC enclosure as indicated on the drawings or as coordinated with the controlled equipment supplier. Outputs that control process equipment specified under other sections or provided under other contracts shall be fully isolated or shall operate relay-type digital output modules or interposing relays in the PLC cabinet.

3. Digital Input Modules. Digital input modules shall sense voltages between 100 and 130 volts ac and shall have LED indicators for each point to display the status of the field contact. Each input module shall be suitable for being connected to a separate voltage source and return. Return voltage may be common to the entire input module. Digital input modules shall provide complete electrical isolation between individual inputs.
4. Digital Output Modules. Digital output modules shall control voltages from 100 and 130volts ac and shall be rated at least 1 ampere. Outputs shall be individually fused and shall have LED indicators to display output status. Each digital output shall be provided with an interposing relay. Outputs shall withstand a surge of at least 80 amperes for one cycle and shall have an off-state leakage current not to exceed 2.0 mA. Digital input modules shall provide complete electrical isolation between individual inputs.
5. Relay Digital Output Modules. Digital output modules shall control voltages from 24 to 110 volts dc and 24 to 230 volts ac and shall be rated at least 2 amperes. Outputs shall be individually fused and shall have LED indicators to display output status. Digital outputs for motor driven equipment shall be powered by the driven equipment. Outputs shall withstand a surge of at least 80 amperes for 15 milliseconds.
6. Analog Input Modules. Analog input modules shall accept linear 4-20 mA dc signals from field transmitters. Input circuitry shall be floating differential type designed to prevent loop grounding. Analog to digital conversion accuracy shall be at least 12 bit (0-4095 count) resolution. Where analog input signals are grounded outside of the PLC enclosure, isolation shall be provided for the associated analog input point either on the analog input module or through an I/I signal isolator provided in the PLC enclosure.
7. Analog Output Modules. Analog output modules shall transmit linear 4-20 mA dc signals to field devices. Loop power for all analog outputs shall be provided by regulated power supplies in each input/output enclosure and shall be capable of driving a 0 to 600 ohm load. Digital to analog conversion accuracy shall be at least 12 bit (0-4095 count) resolution.
8. Panel Terminations. All PLC input/output signals for field connections shall be terminated through panel enclosure terminal strips. Direct connection of field wiring to the I/O module terminals is not acceptable.
9. Interposing Relays. Interposing relays shall be incorporated on all I/O circuits as shown on the PLC input/output listing, where required by the application of isolate foreign power sources, where the continuous output rating of the PLC relay digital or output module is not sufficient to power the connected device or equipment, or where otherwise required by the System Supplier's equipment. Interposing relays shall be

provided for any digital output module output signal that leaves the PLC enclosure. Interposing relays shall be mounted in the PLC enclosure containing the output module that activates the relays.

- 2.3 OPERATOR INTERFACE TERMINAL (OIT). Operator interface terminals (OITs) shall be provided and programmed by the supplier of the related equipment. OITs shall be capable of monitoring and controlling its specific system with no capabilities for monitoring or controlling any other part of the WWTP processes. OITs shall be provided with one copy of OIT programming software.

The OIT shall be provided on the front of the control panel to allow operator access to set points, control functions, alarm messages and other PLC operating information which is not readily available through lights and switches on the panel front. The OIT shall be a microprocessor based flat panel type. The OIT shall have touch screen and/or keypad interfaces. The OIT shall be provided with process equipment controls and data entry capabilities. The OIT shall display statuses, alarms, and analog process information resident in the associated PLC. The OIT shall provide a nominal 12" diagonal color-TFT display and shall provide 256 display colors. The OIT shall be furnished with a minimum of 4 MB of flash EPROM memory. The OIT shall be provided with a minimum of one RS-232/422/485 port for PLC communications and one RS-232 port for programming. The OIT shall be provided with one Ethernet port if available as a standard or optional feature. The OIT shall have a NEMA Type 4X rating. The operator interface terminal shall be suitable for panel face mounting. The operator interface terminal shall be 12 - 24 volts dc or 120 volts ac powered. The OIT shall have an operating temperature range of 0-50°C with a relative humidity of 10-90% non-condensing. The OIT shall be a Red Lion G310S210 without exception.

- 2.4 COMMUNICATIONS. Each programmable controller system shall be furnished complete with communication hardware modules for local input/output hardware, remote input/output hardware, other programmable controllers, or for host computers as required. Communication hardware shall be compatible with the cable, fiber optic, or radio communication media as required.
- A. Addressability. Each programmable logic controller shall be individually addressable so that only the selected controller responds when queried. At least 30, or a larger number as required, distinct network addresses shall be available. Designation of a controller's network address may be either a software or hardware function.
- 2.7 SHOP-ASSEMBLED SYSTEM ENCLOSURES. Programmable logic controllers and input/output hardware shall be housed in shop-assembled panels as indicated on the Drawings and as described in Section 13570.

PART 3 - EXECUTION

- 3.1 INSTALLATION REQUIREMENTS. PLC installation requirements are specified in Section 13500 except as described herein. Field check, testing, and training shall be as specified in Section 13500.
- 3.2 CONFIGURATION

A. PLC Programming and Configuration.

System software shall be configured by the SYSTEM SUPPLIER. Configuration services shall consist of the creation of the system database, operator interface graphic and tabular display screen formats, password and security implementation, and programming of control units to provide a fully functioning system. The SYSTEM SUPPLIER shall fully configure the system using data provided herein or supplied by the OWNER'S REPRESENTATIVE. The system that is delivered to the field for installation, checkout, and startup shall have all files, or databases, that are configurable in size, be sized in a manner in which there will be a 50% available space available for future work after the completion of this project. This sizing should include the addition of memory modules, disk drives, or any other device to insure the 50% spare space availability. All "tuning" of software that is dependant on space requirements shall be done prior to the completion of this project. Tuning of software programs shall be accomplished in such a manner that the program operates at its highest performance level. These programs include, but are not limited to Microsoft SQL Server, all PLC ladder logic, and others.

- A. Control System Database. The control system database shall be developed and configured by the SYSTEM SUPPLIER. The SYSTEM SUPPLIER shall enter information obtainable from the Contract Documents into the database prior to soliciting input from the OWNER'S REPRESENTATIVE and the OWNER. The SYSTEM SUPPLIER shall determine the need for any "pseudo" database points and shall ascertain and enter all information needed to define these points. The SYSTEM SUPPLIER is responsible for entering all information associated with each point. This includes but is not limited to, descriptions, engineering units, associated displays, areas, security, etc. All fields associated with each database point must be completely filled out accurately.
- B. Graphic Screen Displays. The SYSTEM SUPPLIER shall be responsible for developing and configuring the custom graphic displays. Each piece of major process equipment that is monitored by the control system shall be displayed on one or more graphic screen. Graphic screens shall be representations of the equipment and piping. The screens must accurately show all devices and equipment that is part of the control loops. The requirement for alarm and/or event displays shall also be provided and proven functional prior to acceptance of the system.
- C. Software Functional Requirements. General functional requirements for system configuration are indicated on the Drawings and described in the specifications. The information presented herein and indicated on the drawings illustrates the general functional intent of the system, and may not be sufficient to fully configure the system. The SYSTEM SUPPLIER shall be responsible for determining what additional information may be required to complete the configuration tasks, and for obtaining this information from the OWNER'S REPRESENTATIVE.

3.3 TESTING. Testing shall be conducted as a series of unwitnessed and witnessed tests which progressively demonstrate that the component subsystems and as well as the overall systems conform to the specifications. System testing shall include the following major testing activities:

Preliminary Factory Testing

Initial I/O Point Checkout

Preliminary Field Testing (three separate tests)

Site Demonstration Test (SDT)

- A. Factory Testing. System Supplier shall be responsible for conducting an ongoing testing process during system development and staging to ensure that the system hardware and software components meet the functional requirements defined by the specifications. Simulation hardware/software and test equipment shall be used appropriately to simulate process conditions. Factory testing will normally be unwitnessed; however Owner reserves the right to have Owner staff and/or Engineer witness portions of the preliminary testing.

1. Initial I/O Point Checkout. System Supplier shall perform a complete, end-to-end checkout for every I/O point from the field termination assembly to HMI graphic display. The I/O Point Checkout shall be conducted on all PLCs. System Supplier shall test every input and output point for proper operation, including wired spares. Test signals shall be injected to verify the operation of each Analog Input (AI) and Discrete Input (DI). Each Analog Output (AO) and Discrete Output (DO) shall be also tested for proper operation.

System Supplier shall develop a Point Checkout Form for each I/O point. The checkout form shall include the point tag, descriptor, all checks performed for the point, date and time of the check, and a signoff block for the System Supplier's representative. The completed I/O Checkout forms for all points shall be submitted for Owner and Engineer review prior to scheduling the FDT.

The following items shall be checked for each I/O point:

For each analog input point: Value at 0%, 25%, 50%, & 100% of full scale (ramped in both directions); HiHi, High, Low, LoLo Alarm Limits; Rate of Change limit; Alarm Deadband.

For each analog output point: Milliamp reading at 0%, 25%, 50%, & 100% of full scale (ramped in both directions).

For each discrete input point: Status points - proper indication; Alarm points, proper alarm notification.

For each discrete output point: Proper operation (latching or momentary)

- B. Field Testing. The System Supplier shall perform Field Testing as an integral part of system installation and startup process.

As a minimum, System Supplier shall perform the following tasks:

Calibrate instruments

Confirm network communications

Confirm operation of HMI System

Perform Loop Testing from field device to HMI. Loop Testing shall not be conducted until the associated field wiring has been finalized, including the installation of permanent wire markers. System Supplier shall use forms of the same format as the Initial I/O Point Checkout and shall

verify every I/O point from field device to HMI display. System Supplier shall closely coordinate the Loop Testing with other contractors, suppliers, and Owner.

Verify all equipment control functions, including the operation of automatic control strategies. Actuation of field devices shall be closely coordinated with Owner's staff.

Verify and adjust, as necessary, system performance parameters and system responses under field operational conditions.

- C. Site Demonstration Test (SDT). A Site Demonstration Test (SDT) of the functions, software, and performance shall be conducted after all elements have been installed and all Field Testing (including Loop Testing), have been completed. The SDT shall occur after successful completion of the Field System Operation Test described in Section 01650.

The SDT shall be performed to verify complete operation of the entire system with the equipment installed at the permanent sites and connected to the process I/O, and shall include additional tests required to verify field-installed equipment which was not available at the factory.

The System Supplier shall:

1. Demonstrate each functional requirement identified by the specification.
2. Demonstrate all equipment control functions, including the operation of automatic control strategies.
3. Verify system performance parameters and system responses under field operational conditions.
4. Verify accuracy of documentation, especially operator's manuals, software documentation, Record Drawings, and site operating instructions.

END OF SECTION 13530

SECTION 13550 - SOFTWARE CONTROL BLOCK DESCRIPTIONS

PART 1 - GENERAL

- 1.1 SCOPE. This Section provides functional descriptions of the PLC and HMI computer software requirements for the Instrumentation and Control System as indicated on the Drawings. These descriptions are intended to provide an overview of the operating concept of the plant process equipment rather than describing in detail every operating feature or interlock.
- A. Control System. Specification Section 13500 - Instrumentation and Control System shall apply to all systems described in this Section. The Plant Control System (PCS) consisting of PLCs, OITs, network and HMI computer workstations shall include the process controls and features specified herein. The OIT and HMI interface is to be completely configured as specified herein for all equipment.

PART 2 - PRODUCTS

- 2.1 GENERAL. The descriptions are applicable to the software specified in the Programmable Logic Controller section.

PART 3 - EXECUTION

- 3.1 PLC PROGRAMMING FUNCTIONAL REQUIREMENTS. The following paragraphs describe general configuration tasks that are required for the system PLC(s). These tasks shall be programmed in any applicable PLC. Each PLC may have multiple instances of each of these tasks, or may have no instances of some or all of these tasks. The input/output lists (located on the "I" Drawings) and detailed equipment control descriptions (included herein) should be referenced to determine the requirements for each PLC.

The following paragraphs cover functional requirements of the software, which are generic and may or may not be related to any specific control loop.

- A. Available Process Values. All PLC-generated process alarm, equipment status, and process variable values shall be available at any operator workstation.
- B. Flow Values. Flow values shall be integrated, totalized, and stored in the PLC registers so the values displayed on the HMI computers and on the field processor will be identical.
- C. System Failure. Failure of a PLC shall result in safe shutdown of associated process equipment. Interposing relays shall be provided where required to assure that equipment will revert to its fail-safe condition. Failure of any PLC or its communication shall be alarmed on the HMI computer.
- D. HMI Computers. The HMI computers shall function as a monitoring system, not as a controller,

for the process equipment. The computer shall download set points and other information to the PLCs, and the PLCs shall perform all control algorithms, so a temporary failure of the any HMI computer will not disrupt plant control.

- E. Rack/Module Configuration. The rack and module definitions for each PLC, as well as the PLC communications configuration shall be completely configured to allow proper addressing of all field connected I/O points. This shall include configuration of any remote input/output (RIO) racks.
- F. PLC Database Definition. The PLC database will include both field I/O points and internally generated points required for programming. All field I/O points and internal programming points shall be fully defined according to database naming conventions approved by Owner. As a minimum, each database point shall be provided with a tag name, engineering unit, alarm parameters, and description.
- G. Analog Scaling. Each analog input and output will be appropriately scaled for use in internal PLC programming, monitoring by the HMI computers, or transmission to other PLCs. Requirements for raw count values shall be coordinated with the operator interface software to ensure compatibility.
- H. Equipment Runtimes. For each equipment item whose "run" status is monitored by a PLC, an internal equipment runtime shall be accumulated by the respective PLC. The runtime procedure will monitor the status of the equipment "run" contact and, when the equipment is running, increment a software timer that maintains equipment runtime to within a one-minute resolution. The timer shall stop incrementing, but not reset, when the "run" contact indicates that the equipment is not running. The timer value shall increment an hour counter that maintains an integer value representing the equipment run time in hours. The counter value shall be available for display on the HMI computer. A manual reset of the runtime value shall be available at the HMI computers for personnel at the supervisor level and above.
- I. Change-of-State Alarms. While equipment is controllable from the PLC ("in remote"), discrete output commands shall be compared to their respective process feedback status signal (where available) to verify proper execution. If the feedback status does not match the most recent output command (after an adjustable 2 to 300 second time delay), an alarm message shall be displayed on the HMI computer and the condition shall be logged as an alarm, requiring operator acknowledgment. The alarm shall remain energized until the proper discrete condition is sensed or until the operator resets the alarm through the HMI computer.
- J. Equipment Availability. In general, equipment with PLC control has been provided with a local selector switch that transfers control to the PLC. The PLC shall monitor the position of this switch to determine if the equipment is available for PLC control. If the equipment is not available, the PLC program shall not attempt to implement remote manual or automatic status changes for the equipment. The PLC program may, however, need to implement special routines if equipment unavailability affects a sequence (as described in the detailed equipment descriptions).
- K. Maintained/Momentary Outputs. The need for maintained or momentary control outputs shall be determined from the input/output listing and the electrical schematics. In general, equipment with only one control output indicated in the I/O list shall be programmed for a maintained control output. Equipment with two (or more) control outputs shall be programmed for momentary outputs. Provisions shall be made, in either case, to remove the active state (start, open, forward,

initiate, etc.) control output when an equipment failure is sensed or when the equipment transitions from available to unavailable (local switch change).

- L. Equipment Mode Changes. Unless otherwise indicated in the equipment control descriptions, equipment in automatic mode shall be transitioned to manual mode (and stopped) if the equipment fails or becomes unavailable or if the PLC processor resets.
 - M. Manual/Auto Bumpless Transfer. Unless otherwise indicated in the equipment control descriptions, equipment changes from automatic to manual control shall be bump-less. Equipment running or stopped in automatic mode shall remain running or stopped when manual mode is selected.
- 3.2 HMI FUNCTIONAL REQUIREMENTS. The following paragraphs describe general configuration tasks that are required for the HMI and related software.
- A. Database. The system database, including field I/O and internal points shall be established according to the database point naming conventions approved by Owner's Representative. Database generation for field I/O shall include all required coordination with PLC level addresses. The tag names shall be derived from the descriptions listed in the PCS I/O schedule. The descriptions shall be shortened and spaces converted to underscores in order to be compatible with the software's naming restrictions. Where soft I/O is to be created that is not listed in the ICS I/O schedule, the names for like-in-kind hard I/O shall be used to form the new tag names.

In the default scheme, the format of the tag name is XX-YYY-ZA.

XXX is the ISA function designation.

YYY-ZA is the unique loop designation defined by the P&IDs.

Where possible YYY-ZA will correspond to the loop numbers on the P&IDs.

Otherwise, a unique number should be assigned. Z is a number (1, 2, 3) to designate similar loops associated with trains of equipment. A is a letter (A, B, C) to designate identical functions within the same loop. For instance, if there are two ferric sulfate metering pumps and the loop number chosen is 222, the remote status input for pump number one might be HS-222-1 and the remote status input for pump number two might be HS-222-2. If there is more than one switch input for either pump the tag name would be HS-222-1 A and the second switch would be HS-222-1 B.

Function designations currently defined are listed below:

Analog Inputs

AIT - Analytical Input

EIT - Voltage Input

EIIT - VAR Input

FIT - Flow Input

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IIT - Current Input

JIT - Power Input

LIT - Level Input

PDIT - Differential Pressure Input (Headloss)

PIT - Pressure Input

ST - Speed or Rate Input

TIT - Temperature Input

WIT - Weight Input

ZT - Position Input

Analog Outputs

AC - Residual Proportioning Control

FC - Flow Proportioning Control

SC - Speed or Rate Control

ZC - Position Control

Digital Inputs

AAH - Analytical Alarm High

AAL - Analytical Alarm Low

FSH - High Flow Status

FSL - Low Flow Status

HS - Hand Switch Status

JA - Electrical Alarm

LSH - High Level Status

LSHH - High Water Cutoff Alarm

LSL - Low Level Status

LSLL - Low Water Cutoff Alarm

PDSH - High Differential Status

PS - Pressure Alarm Hi/Lo or Unspecified

PSL - Low Pressure Status

PSLL - Low Pressure Cutoff Alarm

WAL - Low Weight Alarm

XA - General or Unspecified Alarm

YA - Equipment Overload Alarm (Failure)

YS - Equipment Run Status

ZSC - Position Closed Status

ZSO - Position Open Status

Digital Outputs

LC - PLC Generated LWCO Output

XC - General Control Output

YC - Equipment Start/Stop Command

ZCC - Equipment Close Command

ZCO - Equipment Open Command

Initially, the facility database shall be configured so all database points are defined as belonging to a specific area (as allowed by the graphical interface software). The areas designated for the facility shall be coordinated with Owner and Engineer.

- B. Trend Displays. Trending shall be developed to present real-time and historical process data in an X-Y graph format. Real-time trends shall utilize current process values to generate temporary graphs that do not retain data values. Historical trends shall utilize historically collected data and shall access the data files directly for use in the trend display. Historical trends shall allow paging forward and back to the limits of the collected data. The trending package shall be configured to automatically retrieve historical data from the proper data file to accommodate the paging functions. All process parameters shall be historically trended with predefined trend screens/groups configured for easy viewing. As a minimum this shall include all analog inputs, calculated variables, and PID control process set points. Trend pens shall be grouped logically per process and control loop. Trends shall be provided for each PID control process with process, set point, and output displayed together for ease of loop tuning.
- C. Alarms. Complete system alarming shall be configured. This shall include configuration of graphical alarm displays, configuration of audible alarms through the HMI speakers, and remote alarm communications through email, pagers, or cell phones. All process or system alarms shall appear on an alarm summary screen and the alarm banner of each process graphic. Alarms and events shall be color coded on the alarm summary screen, with initial colors based on Owner

conventions or the default colors associated with the graphics package. The colors may be adjusted after meeting with Owner. Alarm prioritizing and area assignments (if any) shall be coordinated with Owner at the first configuration meeting. This shall include configuration of the alarm package for remote communications of alarms. A spreadsheet shall be started at the first configuration meeting to identify all alarm prioritization and functions to document how the system will be configured. This spreadsheet shall later be submitted for approval.

Additional alarms may be requested during construction and startup for any analog process value in addition to what is shown on the P&IDs or specified herein to include low-low, low, high, and high-high alarm values.

For LOW or LOW-LOW analog or discrete alarms which do not apply if associated equipment is not operating, provisions shall be made to prevent/Lock generation of the alarm unless the associated equipment is operating. This shall include alarms such as low amperage alarms for pumps that are not running. This may also include low flows or pressures when associated pumps are not operating (this will only apply if periodic operation of the equipment is considered normal).

Nuisance alarms shall be suppressed for process values that may spike or be irregular by providing an adjustable time delay (1-99 seconds) before alarming. At a minimum, all pressure nuisance alarms shall be suppressed.

All alarms/events shall be time stamped when displayed or printed.

Unacknowledged alarms shall not automatically clear from the alarm summary if they return to normal before being acknowledged.

- D. Reporting. System reporting shall be accomplished using Microsoft Excel. All necessary report development, including formatting, macro development in spreadsheets, etc. shall be provided to access real-time and historical data for reporting. The following historical monthly facility reports shall be provided:

1. Monthly Equipment Report (Runtimes and Failure Count for Each Pump)
2. Monthly Generator Run Times Report
3. Monthly Chemical Usage Report (Based on Run Times of Chemical Pumps)

- E. Historical Data Collection. System data shall be collected for historical archiving and for use in trending and reporting functions. Requirements for data collection shall be as needed to support the trends and reports developed. At a minimum all analog process values, runtimes, volume totals, and flow totals shall be historically collected. Collections intervals shall be coordinated with Owner and Engineer but shall initially shall be as follows;

Pressures: 1 minute

Flows: 5 minute

Levels: 5 minute

Analytical: 5 minute

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Totals: 1 day at midnight

Runtimes: 1 day at midnight

- F. Manual Entry of Data. The human machine interface (HMI) computers shall allow manual entry of laboratory data and other variables, which shall then be available for display and use in reports. Operator entered commands from any of the HMI computers shall be logged at all HMI computers.
- G. Screen Navigation. HMI screen navigation shall be accomplished by any of the following:
 - 1. Menu bar Screen Pull-down Menu: Navigates to selected screen or popup window.
 - 2. Navigation Buttons: Navigates to the indicated screen or popup window.
 - 3. Equipment Symbols: Navigates to equipment control popup window
 - 4. Process Area Symbol: Navigates to the screen associated with process
- H. Security. Users shall login via login names and passwords. Users shall be assigned security groups to provide varying predefined degrees of security. The following security groups shall be provided:
 - 1. GUEST: View only. Default security level for non-users. Only screen navigation is allowed.
 - 2. OPERATOR: Staff performing operation type functions such as start/stop equipment, adjust process control set points.
 - 3. SUPERVISOR: Staff performing Supervisor type functions such as operator functions, adjusting advanced process control set points, modify runtimes etc.
 - 4. ADMINISTRATOR: Allows complete access to all functions including configuration and programming. All Supervisor functions are available.
- I. Graphics Conventions. Any alterations of these requirements shall be submitted to the Owner's Representative for approval. The Owner's Representative will take into consideration the elimination of requirements that are not possible using the specified HMI interface.
 - 1. Process screens shall be draw similar to P&ID diagrams using those provided in the contract documents for guidance or those provided by equipment suppliers when not available in the contract documents. All equipment monitored or controlled shall be shown as well as any valves, gates, pumps, motorized equipment, chemical injection points, within the process piping. Small and otherwise insignificant non monitored equipment may be excluded at the owner's approval. Screen backgrounds shall be the lightest gray. Process lines shall be shown as solid lines of varying thickness to coincide with pipe or channel size with color matching as possible the pipe and structure painting as approved from Division 9.
 - 2. Equipment symbols are drawn and animated using the following conventions:

Structural (tanks, wells, basins, channels, etc): Dark Grey thickened lines with foreground of process following piping color convention. Level animated symbol shall have process color animated on white background.

No Status Equipment: Black lines with white foreground

Stopped or Off: Black lines with green foreground

Running or On: Black lines with red foreground

Valve/Gate Closed: Black lines with green foreground

Valve/Gate Mid-Travel: Black lines with half red half green foreground

Valve/Gate Open: Black lines with red foreground

Circuit Breaker Open: Black lines with green foreground

Circuit Breaker Closed: Black lines with red foreground

Alarm: Yellow blinking Red until acknowledged

Pilot Light Energized: Bright shade of status color

Pilot Light De-Energized: Dark shade of status color

Value Display: Dark Blue value with Black units on white background. Value turns red on alarm.

Alarm Text: Black text on Yellow background with Red border with background blinking Red until acknowledged

Event Text: Black text

In order to prevent confusion with run status color conventions; pump, mixer, collector, etc. equipment shall have part of the symbol motion animated for clear indication of moving equipment. Valves and gates are excluded from this requirement. All levels which are monitored shall be vertically animated proportional to their level. Animation shall not be required if the specified HMI is not capable or if it will noticeably adversely affect system performance.

Display of field instrument process measurements shall be provided in a display panel symbol with a dark grey background. The first line shall be the instrument tag displayed as white text with the text turning red if the signal goes out of range or broken wire. The next line shall be the service description displayed as white text. The process value shall be displayed in a white box with a Dark Blue value with Black units. The value shall turn red on alarm. Additional descriptions and value boxes shall be added to the symbol for totalizer and set point display.

- J. Screen Layout. Each full screen shall have a blue or green background menu bar at the top 5-8% of the screen to include:

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1. Screen Name
 2. Screen navigation pull-down menu or popup mimicking one: All full screens shall be listed and navigated from this pull down.
 3. Screen Navigation buttons for commonly used screens
 4. User logged in and security group they belong to
 5. Date and time
- K. Each full screen shall have a blue or green background alarm bar at the bottom 10-15% of the screen to include:
1. Scrollable 4 displayed lines of the alarm summary
 2. Acknowledge displayed button
 3. Total number of unacknowledged alarms displayed
 4. Navigation button to Alarm Summary and Alarm History screens
- L. Set points button for navigation to a popup scroll down list of all set points associated with the displayed system.
- M. Screen Content. All process I/O and calculated variables shall be displayed on screens. Where timers are used for control functions their count and preset shall be displayed. Where a PID is used for control of a process the process value and set point shall be displayed. All totalizers shall be displayed with their associated flows. All runtimes shall be displayed near their associated equipment or within the equipment popup screen. The following screens shall be provided as a minimum:
1. Login Popup: A Security Popup from this popup shall include the ability to add, delete, or modify users.
 2. Equipment Runtimes Popup: Shall include a scroll down list of all motorized equipment elapsed runtimes and the ability to change them based on security level.
 3. Report Screen: Shall provide access to reporting software and the ability to view and print reports.
 4. Trends Popup: Shall provide for selection of predefined trend groups to be displayed as a popup. A minimum of 4 separate trend pop ups shall be able to be displayed at any one time, each with a minimum of 6 pens able to be displayed. Trend pop ups shall include historical trend information. Trends may be static or scroll as new real-time info is gathered. Preconfigured time spans shall be provided for week, day, 8 hr, 4 hr, 1 hr, 10 minutes at the press of a button. Pens shall have their descriptions and values displayed as a slide bar is moved across the trend graphic.
 5. Process Overview Screens: An individual process overview screen shall be provided. All major plant flows, their totals, levels, and major analytical process values shall be

displayed. The background of each major area shall be separately colored and allow navigation to the process screen by clicking on the area.

6. Alarm Summary Screen: Shall include current active or unacknowledged alarms.
7. Alarm History Popup: Shall include a history of all alarms and events. This history shall be logged to a file daily for archiving. The ability to easily open/view archived history files shall be available.
8. Control System Overview Screen: Shall include all PLCs and radios. The Communication status shall be shown for all equipment. PLCs shall show their operating mode, any major faults or warnings, and their 10 configuration displayed.

All Screens shall be available from all Screens by menu bar buttons.

3.3 EQUIPMENT CONTROL AND CONTROL MODE OVERVIEW. The following paragraphs explain the general format and control modes that are used in the detailed equipment descriptions. These paragraphs apply to the attached, project specific, equipment control descriptions included herein.

- A. General. Appended to this section are the equipment control programming requirements, with requirements for both PLC programming and the minimum operator interface functions. The HMI requirements represent the anticipated display generation requirements and shall be adjusted if the PLC programming warrants adjustment.
- B. Control Modes. There are two general control modes available for the process equipment: 1) remote manual, and 2) remote auto. Remote manual control provides a means for operators to adjust equipment status or set point, through the HMI, using manually initiated commands. Remote automatic control provides a means for automatically changing equipment status or set point based on measured process parameters, calculated values, or operator set points. Some equipment may have more than one remote auto mode. Unless specifically stated otherwise equipment control modes shall be set to remote manual mode on PLC power up. Unless specifically stated otherwise upon loss of utility power control shall resume with the control mode established prior to the power failure, but equipment starts shall be staggered with individual restart upon loss of power timers.

Descriptions for local control are included in the detailed equipment control descriptions. They are provided primarily for documentation purposes and for information. These controls are hardwired and require no programming effort.

3.4 DETAILED EQUIPMENT CONTROL DESCRIPTIONS. The following paragraphs describe specific function requirements for various software control blocks in the control system. These descriptions are intended to provide an overview of the operational concept for the facilities, rather than describing in detail every operating feature or interlock.

The process control descriptions describe the manner in which equipment is controlled in local and remote modes. The format of the control descriptions is as follows:

LOOP DESCRIPTION TITLE

Identifies the equipment associated with the description.

ASSOCIATED PLC

Identifies the PLC where equipment control is carried out.

ASSOCIATED P&ID(S)

Identifies the P&ID where the equipment is shown.

LOCAL MANUAL MODE

Defines manual control provided at the equipment.

LOCAL AUTO MODE

Defines automatic control provided through local control panels.

REMOTE MANUAL MODE

Defines manual control of the equipment through the PLANT CONTROL SYSTEM.

REMOTE AUTO MODE

Defines automatic control of the equipment through the PLANT CONTROL SYSTEM.

ALARMS

Identifies equipment alarms monitored by the PLANT CONTROL SYSTEM.

STATUS INDICATIONS

Identifies equipment status that is monitored by the PLANT CONTROL SYSTEM.

PLC POWERUP

Identifies the mode of control on PLC powerup after a manual shutdown of the PLC.

POWER FAILURE

Identifies the mode of control on restoration of power following a power failure.

HMI REQUIREMENTS

Identifies the plant control system HMI display where the equipment shall be controlled and monitored, and HMI control requirements.

TREND REQUIREMENTS

Included only where required, and describes the values that must be presented in trend format.

CALCULATIONS

Included only where required, and describes the calculations necessary to perform the automatic controls that have been defined.

LOOP DESCRIPTION TITLE**Wet Well Tank Level**

Function: Monitor level within the Wet Well Tank and actuate high and low level alarms.

Operational Description: The Wet Well Tank stores storm water influent and provides a reservoir for pumping to the public storm sewer. Level is monitored to control the starting and stopping of the Lift Station Pumps, as well as activate alarms.

Setpoints and Ranges: LE-1 shall have a calibrated range of 0 – 20 feet.

LS-2 shall be physically set to activate at 10.0 feet above the tank floor.

LS-1 shall be physically set to activate at 4.0 feet above the tank floor.

Interface Requirements: Provide tank level signal and a low level alarm switch signal to Loop “Lift Station Pumps”.

ASSOCIATED PANELS

LCP-Niagara

LCP-1, LCP-2, LCP-3

ASSOCIATED EQUIPMENT

LE-1, LS-1, LS-2

ASSOCIATED PLC

PLC within LCP-Niagara

ASSOCIATED P&ID(s)

I-100

LOCAL MANUAL MODE

None.

LOCAL AUTO MODE

None.

REMOTE MANUAL MODE

None

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REMOTE AUTO MODE

None.

ALARMS

The PLC shall calculate configurable alarms related to measured tank levels and annunciate discrete alarms from the scaled analog inputs. Provide two configurable alarms for use by the operator designated Wet Well Tank High and Wet Well Tank Low. Trigger set points for each alarm shall be entered by the operator. The operator shall have the ability to disable the configurable alarms independently.

Upon activation of float switch LS-2 a separate Wet Well Tank High-High alarm shall be annunciated.

Upon activation of float switch LS-1 a separate Wet Well Tank Low-Low alarm shall be annunciated.

All alarms shall activate the remote mounted alarm strobe and horn.

STATUS INDICATION

Tank Level and Alarms.

PLC POWERUP

Not Used.

POWER FAILURE

Not Used.

HMI REQUIREMENTS

The display layout for the Wet Well Tank shall be similar to the P&ID. The tank symbols shall include an active graphic which rises and falls in proportion to the tank level signals. The display shall have indicators for both the discrete and configurable tank level alarms. The configurable alarms shall be selectable targets, with a popup display that allows the operator to input target values for the alarms.

TREND REQUIREMENTS

Wet Well level.

CALCULATIONS

None.

LOOP DESCRIPTION TITLE**Lift Station Pumps**

Function: Monitor and control the Lift Station Pumps.

Operational Description: The Lift Station Pumps draw from the Wet Well and convey storm water to the downstream storm sewer. The pumps are called to start and stop automatically when appropriate elevations are indicated by the “Wet Well Tank Level” loop. The pumps are variable speed, and rely on level signal from the “Wet Well Tank Level” loop to control speed of the pumps to maintain the pump ON wet well level.

Interface Requirements: The Lift Station Pumps shall interface with the tank level signal and the tank low-low level alarm signal from loop “Wet Well Tank Level”.

ASSOCIATED PANELS

LCP-Niagara

LCP-1, LCP-2, LCP-3

ASSOCIATED EQUIPMENT

PUMP-1, MS-1, TS-1

PUMP-2, MS-2, TS-2

PUMP-3, MS-3, TS-3

LE-1, LS-1

ASSOCIATED PLC

PLC within LCP-Niagara

ASSOCIATED P&ID

I-100

LOCAL MANUAL MODE

Local manual control of each pump shall be provided through the HAND-OFF-REMOTE (H-O-R) selector switch mounted on the local control panel. When the selector switch is moved to the HAND position, the pump shall run until the selector switch is moved to the OFF position. Pump speed control shall be by the local speed control on the pump’s AFD.

Each pump motor shall be provided with a motor temperature switch and a moisture intrusion switch. Output from these switches shall be routed to the LCP, which shall alarm on the motor high temperature and / or moisture intrusion condition and shutdown the pump if safe motor operating temperatures are exceeded.

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Each pump shall be interlocked to prevent operation when the associated discrete Low-Low level alarm is active from the Wet Well Tank Low-Low level switch (LS-1).

Each pump VFD shall generate a FAIL alarm in response to loss of operation.

Alarms may be reset locally at the LCP via push button or remotely from the HMI.

LOCAL AUTO MODE

None.

REMOTE MANUAL MODE

Remote Manual Control of each pump shall be provided through the PLC. When the H-O-R selector switch is in the REMOTE position and MANUAL is selected at the HMI, the pump shall be operated from the HMI using manual operator commands.

Pump speed shall be adjusted based on input entered on the manual speed control at the HMI.

REMOTE AUTO MODE

Remote automatic control of each pump shall be provided through the PLC. When the H-O-R selector switch is in the REMOTE position and AUTO is selected at the HMI, the pumps shall be activated based upon Wet Well Tank Level (LE-1). Initial start/stop level set points shall be as follows:

Lag Pump 2 Start Level – Wet Well Floor plus 8.0 feet.

Lag Pump 1 Start Level – Wet Well Floor plus 7.0 feet.

Lead Pump Start Level – Wet Well Floor plus 6.0 feet.

All Pumps Stop Level – Wet Well Floor plus 5.0 feet.

Pump speed shall be controlled to maintain a level set point on the Lift Station Wet Well Tank Level (LE-1). Initial setting shall be Lead Pump Start Level.

The three pumps shall be configured as lead / lag 1 / lag 2. The lead / lag1 / lag 2 pumps rotate at an operator adjustable time of day when set to AUTO or by the operator selecting which pump to be the lead pump. If the lead pump fails or is not in AUTO, and the lag 1 pump is in AUTO, the lag 1 pump will be called to run. If the lag 1 pump is running and the lead pump fail alarm clears or is placed in AUTO, the lead pump will start and the lag 1 pump will stop. If the lag 1 pump fails or is not in AUTO, and the lag 2 pump is in AUTO, the lag 2 pump will take over the functions of the lag 1 pump.

ALARMS

HMI shall annunciate the following alarms for each pump: AFD Fail; Moisture Intrusion; Motor High Temperature.

The PLC shall calculate a change-of-state alarm related to loss of run feedback from an operating pump.

STATUS INDICATION

Display for each pump shall indicate Pump Running / Stopped, Pump Speed, Pump Motor Current, Pump in Remote / Local; Pump in Auto / Manual, Moisture Intrusion Alarm; Motor High Temperature Alarm; AFD Fault.

Each Pump shall be provided with a resettable elapsed time run meter.

PLC POWERUP

On PLC power up, control of the pump shall be set to Remote Auto mode.

POWER FAILURE

Control of the pumps shall resume with the control mode established prior to the power failure. The control system shall not alarm failure of a pump on power restoration due to power failure restart delays. Multiple pumps shall not be restarted at the same time. An adjustable timer shall delay the pump from starting immediately after a power failure.

HMI REQUIREMENTS

The pumps shall be depicted on the associated process display. The display layout shall be similar to the P&ID. The pump symbols shall be selectable targets that retrieve the respective popup display. The popup display shall contain control targets which allow selection of pump auto and manual control modes, pump manual control (start/stop), pump speed, fault reset. The display shall also contain input fields for entering the level set points. The lead / lag controls described above shall also be displayed.

TREND REQUIREMENTS

Pump speed, motor current.

CALCULATIONS

None.

LOOP DESCRIPTION TITLE**Lift Station Pump Flow**

Function: Monitor and totalize Lift Station Pump flow to the public storm sewers.

Operational Description: The flow of storm water to the public storm sewer is monitored for archive purposes and to control the flow rate from the Lift Station Pumps.

Interface Requirements: The flow signal shall be provided to Loops “Lift Station Pumps” for use in speed control of the pumps.

Setpoints and Ranges: The flow meter shall have a calibrated range of 0 – 12,000 gallons/minute.

ASSOCIATED PANEL

LCP-Niagara

ASSOCIATED EQUIPMENT

FIT-1, FE-1

ASSOCIATED PLC

PLC within LCP-Niagara

ASSOCIATED P&ID

I-100

LOCAL MANUAL MODE

Flow rate and total shall be displayed on FIT-1.

LOCAL AUTO MODE

None.

REMOTE MANUAL MODE

None

REMOTE AUTO MODE

None.

ALARMS

The PLC shall calculate configurable alarms related to measured flows and annunciate discrete alarms from the scaled analog input. Provide two configurable alarms for use by the operator designated Flow High and Flow Low. Trigger set points for each alarm shall be entered by the operator. The operator shall have the

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ability to disable the configurable alarms independently.

All alarms shall activate the remote mounted alarm strobe and horn.

STATUS INDICATION

Instantaneous Pumped Flow, Totalized Flow

PLC POWERUP

Not Used.

POWER FAILURE

Not Used.

HMI REQUIREMENTS

The display layout for the Pumped Flow shall be similar to the P&ID. The flow meter shall be shown on the force main pipeline display with an indication of measured flow in engineering units of gallons/minute. The display shall have indicators for configurable flow alarms. The configurable alarms shall be selectable targets, with a popup display that allows the operator to input target values for the alarms.

Display values from the totalizer, including current gross total in gallons.

TREND REQUIREMENTS

Flow Rate.

CALCULATIONS

None.

LOOP DESCRIPTION TITLE**Standby Generator and Switchgear**

ASSOCIATED PANELS

LCP-GEN-1, LCP-ATS-1, BATTERY CHARGER

ASSOCIATED EQUIPMENT

GEN-1, ATS-1, BATTERY CHARGER

ASSOCIATED PLC

PLC within LCP-1

ASSOCIATED P&ID(S)

I-101

LOCAL MANUAL MODE

Not Applicable.

LOCAL AUTO MODE

After failure of utility power, an engine generator will be operated through automatic transfer switch, if engine generator switch is in AUTO mode.

REMOTE MANUAL MODE

Not Applicable.

REMOTE AUTO MODE

Not Applicable.

ALARMS

The following alarms shall be provided: FUEL LOW, GENERATOR COMMON ALARM, BATTERY CHARGER LOSS OF UTILITY POWER, BATTERY VOLTAGE HIGH, BATTERY VOLTAGE LOW

STATUS INDICATIONS

The HMI shall indicate the following status: UTILITY / GENERATOR POWER, GENERATOR RUNNING, GENERATOR IN COOL DOWN MODE, GENERATOR IN AUTO, GENERATOR SYSTEM READY.

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PLC POWERUP

On PLC powerup, monitoring of engine generator shall indicate current status.

POWER FAILURE

Monitoring of the engine generator shall resume along with current status.

HMI REQUIREMENTS

The standby generator and associated switchgear shall be depicted on a simplified electrical functional block diagram (one-line) along with other associated electrical distribution equipment monitoring.

TREND REQUIREMENTS

Generator Run Status.

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LOOP DESCRIPTION TITLE

Miscellaneous Alarms Loop

ASSOCIATED PANELS

None

ASSOCIATED EQUIPMENT

Security System Control Panel (SSCP)

Fire Alarm Control Panel (FACP)

ASSOCIATED PLC

PLC within LCP-1

ASSOCIATED P&ID(S)

I-101

LOCAL MANUAL MODE

Not Applicable.

LOCAL AUTO MODE

Not Applicable.

REMOTE MANUAL MODE

Not Applicable.

REMOTE AUTO MODE

Not Applicable.

ALARMS

The following alarms shall be provided: FIRE DETECTED

STATUS INDICATIONS

DOOR OPEN ELECTRICAL ROOM, DOOR OPEN REST ROOM, DOOR OPEN WET WELL

PLC POWERUP

Not Applicable.

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POWER FAILURE

Not Applicable.

HMI REQUIREMENTS

The alarms shall be depicted on a dedicated miscellaneous alarms display. The display shall have indicators for each discrete alarm.

END OF SECTION 13550

SECTION 13560 - INSTRUMENTATION GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 SCOPE

This section covers the furnishing of all instrumentation equipment required as indicated on the drawings. Principal components of the instrumentation systems shall be as indicated on the P&ID (I) Drawings and as indicated on the Instrument Device Schedules attached to this Section 13560.

1.2 SYSTEM SUPPLIER

- A. The CONTRACTOR shall provide the services of a single manufacturer or supplier, hereinafter referred to as the SYSTEM SUPPLIER. SYSTEM SUPPLIER shall select the equipment furnished under this Section for its superior quality and the intended performance. The SYSTEM SUPPLIER shall install all equipment in accordance with the manufacturer's instructions. Equipment and materials used shall be subject to review and shall comply with the following requirements.
- B. General Equipment Requirements. Specification Section 01610 - General Equipment Requirements section shall apply to all equipment provided under this section.
- C. Drawings. Supplementing this Section, the Drawings indicate locations and arrangement of instruments and enclosures, provide mounting details, and may show device schedules and other information regarding the connection and interaction with other equipment.
- D. Corrosive Fluids. All parts, which are exposed to corrosive conditions, shall be made from corrosion resistant materials. SYSTEM SUPPLIER shall submit certification that the instrument manufacturer approves the selection of materials of primary elements that are in contact with the specified process fluid to be inert to the effects of the process fluid.
- E. Elevation and Temperature. All instruments shall be designed to operate within an elevation range of 0.0 to 500.0 feet NAVD 88 and a temperature range of -20 °F to 105 °F.
- F. Power and Instrument Signals. Unless otherwise indicated, electric power supply to the instrumentation equipment will be unregulated 120 volts ac. unless otherwise indicated; all transmitted electronic analog instrument signals shall be 4-20 mA dc and shall be linear with the measured variable.
- G. Appurtenances. Signal converters, signal boosters, amplifiers, special power supplies, special cable, special grounding, and isolation devices shall be furnished as needed for proper performance of the equipment.
- H. Interchangeability and Appearance. To the extent possible, instruments used for similar types of functions and services shall be of the same brand and model line. Similar components of different instruments shall be the products of the same manufacturer to facilitate maintenance and stocking of repair parts. Whenever possible, identical units shall be furnished.

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- J. Programming Devices. A programming or system-configuring device shall be provided for systems that contain any equipment that requires such a device for routine calibration, maintenance, and troubleshooting. The programming device shall be complete, newly purchased for this project, and shall be in like-new condition when turned over to OWNER at completion of startup.
 - K. Device Tag Numbering System. All devices shall be provided with permanent identification tags. The tag numbers shall agree with SYSTEM SUPPLIER'S equipment drawings and shall be as close as practical to the tag numbers used on the project drawings and device schedules. All field-mounted transmitters and devices shall have stamped stainless steel identification tags. Panel, subpanel, and rack-mounted devices shall have laminated phenolic identification tags securely fastened to the device. Hand lettered or tape labels will not be acceptable.
- 1.3 SUBMITTALS. Submittals shall be as required in Section 01300.
- 1.4 DELIVERY, STORAGE, AND SHIPPING. Delivery, storage and shipping shall be as required in Section 01612.

PART 2 - PRODUCTS

- 2.1 INDIVIDUAL DEVICE SPECIFICATIONS. Individual instruments and related devices shall be provided as specified in one or more of the following sections:
- A. Section 13562 - Flow Instruments
 - B. Section 13563 - Pressure and Level Instruments

PART 3 - EXECUTION

- 3.1 INSTRUMENTATION INSTALLATION REQUIREMENTS. Instruments shall be installed and calibrated in accordance with the following requirements.
- A. Field Calibration. After each instrument has been installed, a technical representative of SYSTEM SUPPLIER shall calibrate each instrument and shall provide a written calibration report for each instrument, indicating the results and final settings. The adjustments of calibrated instruments shall be sealed or marked, insofar as possible, to discourage tampering. Instrument calibration shall be done before checkout of the system operation. A typical instrument calibration report is attached to the end of this section.
 - B. Systems Check. A technical representative of SYSTEM SUPPLIER shall participate in the checkout of instrumentation systems.
 - C. Installation Test Equipment. Unless specified otherwise, all test equipment for the calibration and checking of system components shall be provided by SYSTEM SUPPLIER for the duration of the testing work and this test equipment will remain the property of SYSTEM SUPPLIER.
 - D. Mounting of Field Instruments. Instruments shall be mounted so that they can be easily read and

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served and so that all appurtenant devices can be easily operated. Installation details for some instruments are indicated on the Drawings.

3.2 CUSTOMER TRAINING. Instrumentation training is covered in Section 01821.

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INSTRUMENT CALIBRATION REPORT

INSTRUMENT NAME & SERVICE: _____

BRAND & MODEL NO.: _____

TAG OR LOOP NO.: _____

INPUT/OUTPUT RANGE: _____

INPUT	ACTUAL OUTPUT	DESIRED OUTPUT

PROPORTIONAL BAND: _____

RESET: _____

POSITION OF SWITCHES, JUMPERS, ETC.: _____

COMMENTS: _____

DATE OF CALIBRATION: _____

CALIBRATED BY: _____

Schedule 13560-S01 Instrument Device Schedule									
Instrument Tag	Service Description	Device Type	Remarks	Size	Output Type	Output Range	Power	P&ID Drawing	Specification Section
Some Devices Provided with Vendor Packages May Not Be Shown. Refer to Specifications.									
PI-1	Pump Discharge Pressure	Pressure Gauge			NA	0-100 psig	NA		13563
PI-2	Pump Discharge Pressure	Pressure Gauge			NA	0-100 psig	NA		13563
PI-3	Pump Discharge Pressure	Pressure Gauge			NA	0-100 psig	NA		13563
TS-1	Pump-1 Motor High Temperature Switch	Thermal Switch			Contact	NA	NA		11140
MS-1	Pump-1 Moisture in Seal Compartment Switch	Capacitance			Contact	NA	NA		11140
TS-2	Pump-2 Motor High Temperature Switch	Thermal Switch			Contact	NA	NA		11140
MS-2	Pump-2 Moisture in Seal Compartment Switch	Capacitance			Contact	NA	NA		11400
TS-3	Pump-3 Motor High Temperature Switch	Thermal Switch			Contact	NA	NA		11140
MS-3	Pump-3 Moisture in Seal Compartment Switch	Capacitance			Contact	NA	NA		11400
FE/FIT-1	Discharge Flow Meter	Magnetic Flow Meter		12 inch	4-20 mA	0-12,000 gpm	4 Wire		13562

Schedule 13560-S01 Instrument Device Schedule									
Instrument Tag	Service Description	Device Type	Remarks	Size	Output Type	Output Range	Power	P&ID Drawing	Specification Section
LE-1	Wet Well Level Sensor	Submersible Pressure Sensing Level Element			4-20 mA	0-20 feet	2 Wire		13563
LS-1	Wet Well Low Level Sensor	Float Switch			Contact	NA	NA		13563
LS-2	Wet Well High Level Sensor	Float Switch			Contacts	NA	NA		13563

END OF SECTION 13560

SECTION 13562 - FLOW INSTRUMENTS

PART 1 - GENERAL

- 1.1 SCOPE. This section covers the furnishing and installation of a 12-inch magnetic flow meter and associated signal converter as indicated on the drawings. Equipment and services provided under this section shall be subject to the General Instrumentation Requirements specified in Section 13560. This section shall be used and referenced only in conjunction with Section 13560. Supplementing Section 13560, instrument data, special requirements, and options are indicated on the Drawings or the Instrument Device Schedule. When multiple flow instruments of a particular type are indicated on the Data Sheet, and each requires different selectable features, the required features are described on the drawings or in the Instrument Device Schedule.
- 1.2 DESIGN CRITERIA. Each device shall be a pre-assembled, packaged unit. Upon delivery to the work site, each device or system shall be ready for installation with only minor piping and electrical connections required by CONTRACTOR. Primary elements shall derive any required power from the transmitter, unless otherwise indicated. The instruments shall be installed to measure, monitor, or display the specified process at the ranges and service conditions indicated on the drawings or as indicated in the Instrument Device Schedule. The instruments shall be installed at the locations indicated on the Drawings or in the Instrument Device Schedule. Where possible, each instrument shall be factory calibrated to the calibration ranges indicated on the drawings or in the Instrument Device Schedule.
- 1.3 SUBMITTALS. Submittals shall be made in accordance with the requirements of Section 01300.
- 1.4 SHIPMENT, PROTECTION, AND STORAGE. Equipment provided under this section shall be shipped, protected, and stored in accordance with the requirements of Section 01612. Identification of packaging shall be as described in Section 13560.

PART 2 - PRODUCTS

- 2.1 GENERAL. The following paragraphs provide minimum device requirements. The Drawings or Instrument Device Schedule shall be used to determine any additional instrument options, requirements, or service conditions.
- A. Interconnecting Cable. For instruments where the primary element and transmitter are physically separated, interconnecting cable from the element to the transmitter shall be provided. The cable shall be the type approved by the instrument manufacturer for the intended purpose of interfacing the element to the transmitter.
- B. Programming Device. For instruments that require a dedicated programming device for calibration, maintenance, or troubleshooting, one such programming device shall be provided. The programming device shall include appropriate operation manuals and shall be included in the training requirements. For systems that allow the programming device functions to be implemented in software, running on a laptop computer, the software shall be provided instead of the programming device.

2.2 FLOW INSTRUMENTATION

A. Magnetic Flowmeters, Signal Converters, and Accessories.

1. Magnetic Flowmeter. The magnetic flowmeter shall be a completely obstruction less, in-line flow meter with no constrictions in the flow of fluid through the meter. The meter shall consist of a metallic tube with flanged ends and with grounding rings. Flange diameter and bolt drilling pattern shall comply with ANSI/ASME B16.5 for line sizes from one-half inch to 24 inches or AWWA C207 for line sizes larger than 24 inches. Flange class ratings and meter maximum pressure ratings shall be compatible with the adjoining piping. Flangeless wafer insert style meters may be used for pipe sizes up to 6 inches, where compatible with adjacent piping flanges. Self-cleaning bullet-nosed electrodes shall be provided for all meters used for sludge metering. Electrode and liner materials shall be polyurethane and fully compatible with the fluid being pumped, and comply with the requirements specified in the instrument device schedules. Each meter shall be factory calibrated, at a facility, which is traceable to NIST or other standard acceptable to OWNER'S REPRESENTATIVE, and a copy of the calibration, report shall be submitted as part of the operation and maintenance manual submittal.

The meter shall be capable of standing empty for extended periods of time without damage to any components.

The meter housing shall be of a splash-proof, drip-proof and submersible design. The meter housing shall withstand submergence in 30 feet of water for 48 hours without damage. Meters shall be as manufactured by Foxboro, Krohne, ABB, Endress + Hauser, or Rosemount.

2. Magnetic Flowmeter Signal Converters. Separately mounted, microprocessor-based signal converters shall be provided for the magnetic flowmeters. The signal converters shall include output damping, self-testing, built-in calibration capability, and an "empty pipe zero" contact input. The overall accuracy of the magnetic flowmeter transmitter and signal converter shall be ± 0.5 percent of actual flow rate for full-scale settings of 3 to 30 fps. The meter manufacturer shall furnish the signal cable between the converter and the magnetic flowmeter. The signal converter shall be housed in a corrosion-resistant, 120 VAC powered, weatherproof NEMA Type 4X housing and shall be suitable for operation over an ambient temperature range of -30 to +140°F, and relative humidity of 10 to 100 percent. The converter shall have an analog output of 4-20 mA dc. Transmitters tagged on the Drawings or specified to be of the indicating type shall contain a local indicator with a minimum four digit LCD type display, scaled to read in engineering units of flow.

Magnetic flowmeter systems shall provide zero flow stability by means of automatic zero adjustment of a DC excited metering circuit. Converters shall be capable of bi-directional flow measurement. Signal converters shall be of the same brand as the magnetic flowmeters.

The signal converter shall have a non-reset seven-digit, or a manually reset six-digit, totalizer on the face of the enclosure. The signal converter shall be of the "smart" type that can be diagnosed and recalibrated with the use of a hand-held communicator/calibrator device. One device shall be furnished for all converters

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provided by a single manufacturer.

PART 3 - EXECUTION

- 3.1 FIELD SERVICES. Manufacturer's field services shall be provided for installation, field calibration, startup, and training as specified in Section 13560. Instruments shall not be shipped to the Work Site until two weeks prior to the scheduled installation. The SYSTEM SUPPLIER shall be responsible for coordinating the installation schedule with the Contractor. Each shipment shall contain a listing of protective measures required to maintain sensor operation, including a listing of any common construction or cleaning chemicals that may affect instrument operation.

END OF SECTION 13562

SECTION 13563 - PRESSURE AND LEVEL INSTRUMENTS

PART 1 - GENERAL

- 1.1 SCOPE. This section covers the furnishing of all pressure and level instruments and accessories required as indicated on the Drawings. Equipment and services provided under this Section shall be subject to the General Instrumentation Requirements specified in Section 13560. This Section shall be used and referenced only in conjunction with Section 13560. Supplementing Section 13560, instrument data, special requirements, and options are indicated on the Drawings or the Instrument Device Schedule. When multiple pressure and level instruments of a particular type are indicated on the Data Sheet, and each requires different selectable features, the required features are described on the drawings or in the Instrument Device Schedule.
- 1.2 DESIGN CRITERIA. Each device shall be a pre-assembled, packaged unit. Upon delivery to the work site, each device or system shall be ready for installation with only minor piping and electrical connections required by CONTRACTOR. Primary elements shall derive any required power from the transmitter, unless otherwise indicated. The instruments shall be installed to measure, monitor, or display the specified process at the ranges and service conditions indicated on the drawings or as indicated in the Instrument Device Schedule. The instruments shall be installed at the locations indicated on the drawings or in the Instrument Device Schedule. Where possible, each instrument shall be factory calibrated to the calibration ranges indicated in the drawings or in the Instrument Device Schedule. Transmitters or similar measurement instruments shall be calibrated using National Institute of Standards and Technology (NIST) approved bench calibration procedures, when such procedures exist for the instrument type. For "smart" devices, calibration data shall be stored digitally in each device, including the instrument tag designation indicated on the drawings and/or Instrument Device Schedule.
- 1.3 SUBMITTALS. Submittals shall be made in accordance with the requirements of Section 01300.
- 1.4 SHIPMENT, PROTECTION, AND STORAGE. Equipment provided under this section shall be shipped, protected, and stored in accordance with the requirements of Section 01612. Identification of packaging shall be as described in Section 13560.

PART 2 - PRODUCTS

- 2.1 GENERAL. The following paragraphs provide minimum device requirements. The Drawings or Instrument Device Schedule shall be used to determine any additional instrument options, requirements, or service conditions.
- A. Interconnecting Cable. For systems where the primary element and transmitter are physically separated, interconnecting cable from the element to the transmitter shall be provided. The cable shall be the type approved by the instrument manufacturer for the intended purpose of interfacing the element to the transmitter.
- B. Programming Device. For systems that require a dedicated programming device for calibration, maintenance, or troubleshooting, one such programming device shall be provided. The

programming device shall include appropriate operation manuals and shall be included in the training requirements. For systems that allow the programming device functions to be implemented in software, running on a laptop computer, the software shall be provided instead of the programming device.

2.2 PRESSURE AND LEVEL INSTRUMENTATION.

- A. Pressure Gauges. Pressure gauges shall be of the indicating dial type, with C-type phosphor bronze Bourdon tube; stainless steel rotary geared movement; phenolic or polypropylene open front turret case; adjustable pointer; stainless steel, phenolic, or polypropylene ring; and acrylic plastic or shatterproof glass window.

Gauge dial shall be 4-1/2 inch size with white background and black markings.

The units of measurement shall be indicated on the dial face. Subdivisions of the scale shall conform to the requirements of the governing standard. Pointer travel shall be not less than 200 degrees or more than 270 degrees of arc.

Panel-mounted and surface-mounted gauges shall be provided with 1/4 inch NPT connections. All stem-mounted gauges shall be provided with 1/2 inch NPT connections. Where indicated in the drawings or on the Instrument Device Schedule, stem mounted gauges shall have an adjustable viewing angle to allow the gauge to be positioned for optimum viewing.

All pressure gauges shall measure in psi and all vacuum gauges in inches water. All gauges shall have a suitable range to give mid-scale readings under normal conditions. Gauge accuracy shall be 0.5 percent of scale range.

Each gauge shall be provided with a threaded end, ball-type gauge valve. Gauge valve materials shall be compatible with the measured process. Where the process is not defined, gauge valves shall have AISI Type 316 stainless steel wetted parts and Teflon seals. Multi-port gauge valves shall have all unused ports plugged.

Where indicated on the drawings or in the Instrument Device Schedule, a diaphragm seal shall be provided for the respective gauge. Diaphragm seals shall be thread-attached type, with removable AISI Type 316 stainless steel diaphragm, zinc or cadmium plated carbon steel upper housing, and stainless steel lower housing. The upper housing shall be contoured to fit and provide a seat and seal for the diaphragm and shall be designed to permit removal of the gauge with the system under pressure. The lower housing shall be provided with a tapped and plugged 1/4 inch NPT flushing connection. Each diaphragm seal and the gauge served shall be factory assembled, filled with a suitable fluid, and calibrated as a unit.

Gauges shall be installed at the locations indicated on the drawings, with installation conforming to the installation details. All gauges and diaphragm seals shall be installed in the vertical, upright position. Thread sealer, suitable for use with the associated process, shall be used in the assembly of threaded connections. All connections shall be free from leaks. Lines shall be purged of trapped air at gauge locations prior to installation of the gauge or diaphragm seal.

Each gauge shall be provided with all required mounting hardware to securely mount the unit according to the mounting requirements indicated in the drawings or the Instrument Device Schedule.

Unless otherwise indicated, mounting and installation hardware shall be Type 316L stainless steel.

Pressure gauges shall be Ashcroft "1279 Duragauge", or equal.

- B. Submersible Pressure Sensing Level Transmitters. The level transmitter system shall consist of a submersible pressure sensor/transmitter unit that is suitable for direct submersion into the liquid being measured. Sensor size shall not exceed 1.65 inch diameter by 9-inch length. The sensor shall be a solid-state variable capacitance or diffused silicon semiconductor type that shall provide an output signal directly proportional to the sensed pressure over a factory-calibrated range. The sensor assembly shall have a stainless steel or titanium housing and shall be supported by a polyethylene or urethane jacketed cable with a minimum 200 lb test strength. The sensor cable shall be of sufficient length so that no splice or connector is required in the wet or inaccessible area, and the vent tube termination point is located in an area protected from dirt and moisture.

The transmitter shall have a two-wire type 4-20 mA dc current output that is proportional to level. The output shall have surge protection, and shall not be damaged by reverse polarity. The transmitter shall be suitable for an operating temperature range of 0° to +50°C. Accuracy of the level transmitter shall be ± 0.25 percent "best straight line", with an overall combined accuracy of ± 1 percent over the entire operating temperature/pressure range.

Submersible pressure sensing level transmitters shall be Endress Hauser Waterpilot FMX 167 Heavy Duty design version or approved equal.

The supplier shall coordinate the sensor mounting requirements and furnish drawings complete with dimensions and elevations. General installation requirements are indicated on the Drawings.

A sufficient length of sensor-to-transmitter signal cable shall be furnished with the instrument to locate the sensor 25 to 50 feet from the signal converter.

- C. Weighted Float Type Level Switches. Each level switch shall consist of a single-pole, double-throw switch, rated not less than 3 amp ac, sealed and housed in a chemical-resistant polypropylene casing. The switch assembly shall be weighted and suspended on a waterproof, three-conductor, synthetic covered flexible cable with 19 AWG conductors and of such length that no splice or junction box is required in the wet well. Switches shall be suitable for operation at up to 150 V ac within an ambient temperature range of 0 to 60°C. Adjustable mounting hardware shall be provided for supporting each level switch. Switches shall be B/W Controls "Series 7010", Flygt "Type ENM-10", or Warrick Controls "Series M".

PART 3 - EXECUTION

- 3.1 FIELD SERVICES. Manufacturer's field services shall be provided for installation, field calibration, startup, and training as specified in Section 13560. Instruments shall not be shipped to the Work Site until two weeks prior to the scheduled installation. SYSTEM SUPPLIER shall be responsible for coordinating the installation schedule with the Contractor. Each shipment shall contain a listing of protective measures required to maintain sensor operation, including a listing of any common construction or cleaning chemicals that may affect instrument operation.

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END OF SECTION 13563

SECTION 13570 - PANELS AND APPURTENANCES

PART 1 - GENERAL

- 1.1 SCOPE. The Panels and Appurtenances section covers the furnishing of panels and appurtenances as indicated on the Drawings and listed in the attached Equipment Schedule 13570-S01.

This Section also describes requirements for panels furnished under other sections whose respective specification sections refer to this Section. Panels furnished under other Sections are may not be listed in the attached Equipment Schedules.

All control panels shall be UL 508A labeled. The short circuit rating of each panel with voltages greater than 120 VAC shall meet or exceed 45kAIC at 480V ac.

- 1.2 GENERAL. Equipment furnished and installed under this section shall be fabricated and assembled in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.
- A. General Equipment Requirements. Section 01610 - General Equipment Requirements shall apply to all equipment and materials provided under this Section if requirements in this specification differ from those in the General Equipment Requirements, the requirements specified herein shall take precedence.
- B. Drawings. General dimensions and arrangements are indicated on the Drawings. System Supplier shall be responsible for coordinating the enclosure sizes and arrangements to accommodate the equipment provided.
- 1.3 SUBMITTALS. Submittals shall be made as specified in Section 01300.
- 1.4 DELIVERY, STORAGE, AND SHIPPING. Delivery, storage and shipping shall be as per Section 01612.

PART 2 - PRODUCTS

- 2.1 PANEL DESIGN AND FABRICATION FEATURES. All panels furnished shall conform to the stipulations of NEMA ICS-6-1993. Unless indicated otherwise on the Drawings, the following paragraphs describe general fabrication specifications for the PLC cabinets, control panels, enclosures, and subpanels.
- A. Performance and Design Requirements. The design of the systems furnished hereunder shall utilize concepts, techniques and features that provide maximum reliability and ease of maintenance and repair. The systems shall include board-level devices such as light emitting diodes or other indicators to facilitate quick diagnosis and repair. Diagnostic software shall be furnished to facilitate system-level troubleshooting. Where redundant hardware is provided, the system shall be capable of performing all specified functions, without reconfiguring hardware or

software, with only one device of each category in service.

1. Factory Assembly. Equipment shall be shipped completely factory assembled, except where its physical size, arrangement, configuration, or shipping and handling limitations make the shipment of completely assembled units impracticable.
2. Expandability. The system shall be capable of 20% expansion of input and output digital and analog points.

The equipment provided for the instrumentation and control system shall be suitable for the service conditions specified in the attached equipment sections. All equipment shall be designed and selected to operate without degradation in performance throughout the environmental extremes specified. Equipment shall be designed to prevent the generation of electromagnetic and radio frequency interference and shall be in compliance with FCC Rules and Regulations, Part 15, for Class A computing devices.

Ambient Temperature. All equipment located outdoors shall be suitable for operation in an ambient temperature range 0°C to 60°C and a relative humidity of 5 to 100 percent. Heaters and air conditioning/cooling equipment shall be provided when indicated on the Drawings and / or where essential to maintain equipment within its manufacturer-recommended operating ranges.

Deleterious Effects. All system equipment will be installed in an outdoor location. SYSTEM SUPPLIER shall furnish any additional air cleaning equipment or other protective measures necessary for proper operation of the system. All input/output hardware shall meet or exceed, without false operation, all requirements of NEMA ICS-1-109.60, Electrical Noise Tests.

2.2 PANEL INTERIOR MOUNTED DEVICES.

- A. Regulated DC Power Supplies. Power supplies shall be suitable for an input voltage variation of ± 10 percent, and the supply output shall be fused or short circuit protected. Output voltage regulation shall be as required by the instrumentation equipment supplied. Backup power supply units shall be provided which will automatically supply the load upon failure of the primary supply. The backup supply systems shall be designed so either the primary or the backup supply can be removed, repaired, and returned to service without disrupting the instrument system operation. Multiloop power supply connections shall be individually fused so a fault in one instrument loop will be isolated from the other loops being fed from the same supply. Fuses shall be clearly labeled and shall be located for easy access. Multiloop supply systems shall be oversized for an additional 10 percent future load. Failure of a multiloop supply shall be indicated on the respective instrument panel or enclosure.
- B. Relays. Relays indicated to be provided in panels, enclosures, or systems furnished under this section shall be of the plug-in socket base type with dustproof plastic enclosures unless noted otherwise. Relays shall be UL recognized and shall have not less than double-pole, double-throw contacts. Control circuit relays shall have silver cadmium oxide contacts rated 10 amperes at 120 Vac. Electronic switching-duty relays shall have gold-plated or gold alloy contacts suitable for use with low-level signals. Relays used for computer input, alarm input, or indicating light service shall have contacts rated at least 3 amperes. Time delay relays shall have dials or switch settings engraved in seconds and shall have timing repeatability of ± 2 percent of setting. Latching and special purpose relays shall be as required for the specific application. Unless otherwise indicated, all relays shall have an integral pilot light that illuminates to indicate an energized condition. Relays shall be Eagle Signal "Series 22, 80"; IDEC "Series RR"; Potter & Brumfield

"Series KRP, CB"; or Struthers-Dunn "Series A3, A4".

- C. Intrinsically Safe Relays. Relays shall be solid-state electronic type in which the energy level of the sensing or actuation circuit is low enough to allow safe use in hazardous areas. Relays shall be located in non-hazardous areas. Relays shall be Consolidated Electric or Gems "Safe-Pak".
- D. Instrument Wiring. All internal instrument and component device wiring shall be as normally furnished by the manufacturer. Annunciator and indicating light circuits shall be minimum 16 AWG. Electronic analog circuits shall be 16 AWG twisted and shielded pairs rated not less than 300 volts. Analog circuits shall be separated from ac power circuits.

All wiring shall be grouped or cabled and firmly supported inside the panel. Each individual wire in power, control, and instrumentation circuits shall be provided with identification markers at each point of termination. The wire markers shall be positioned to be readily visible for inspection and the identification numbers shall match the identification on the supplier's panel wiring drawings. Wiring shall be bundled in groups and bound with nylon cable ties or routed in Panduit or similar nonmetallic slotted ducts. Ducts shall be readily accessible within the panel, with removable covers, and with space equal to at least 40 percent of the depth of the duct remaining available for future use after completion of installation and field wiring. Sufficient space shall be provided between cable groups or ducts and terminal blocks for easy installation or removal of cables.

- E. Surge Protection.
 - 1. Power Entrance Three Phase Panels. The power entrance to each panel shall be provided with a surge protection device. Furnish three phase transient voltage surge suppressor in control panel to protect panel components from potential damage from transient voltages caused by lightning or surges on incoming power line. Furnish indication light to indicate unit is functioning. TVSS shall be Square D SDSA3650 or approved equal.
 - 2. Power Entrance Single Phase Panels. The power entrance to each panel shall be provided with a surge protection device. Surge arresters shall be Transtector "ACP-100 Series", Power Integrity Corporation "ZTA Series", Phoenix Contact "Mains PlugTrab", or MCG Surge Protection "400 Series".
 - 2. All connections to coaxial-based networked equipment (including CCTV, CATV, Ethernet, and satellite) where any part of the circuit is outside of the building envelope. Surge arresters shall be Telematic "VP08", Transtector "TCP Series", Phoenix Contact "CoaxTrab Series", or Northern Technologies "TCS-CP3 Series".
 - 3. All analog signal circuits where any part of the circuit is outside of the building envelope. Circuits shall be protected at both the transmitter and the control system end of the circuit. Surge protection devices shall not impede or interfere with the use of smart transmitter calibration/communication. Protection devices located near the transmitter shall be Telematic "TP48." Protection devices in control panels shall be Transtector "TSP Series", Telematic "SD Series", Phoenix Contact "PipeTrab Series", or Citel "BP1-24."
 - 4. All metallic pair (twisted and untwisted) conductor local area network and data highway termination points, where any part of the data highway cable is routed outside

of the building envelope. Single-port protective devices shall be Phoenix Contact "PlugTrab Series" or Telematic "NP Series."

5. All serial, PLC data highway, and remote I/O network termination points where any part of the circuit is routed outside of the building envelope. Surge protection devices shall be Transtector "DLP Series" (RS-232); Transtector "FSP4000MC Series" (RS-422); Phoenix Contact "PlugTrab Series"; or Citel "E280 Series".
 6. All telephone lines at points of connection to the system. Protection devices for dial-up circuits shall be Transtector "TSJ Series", Telebyte "Model 22PX", Citel "BP1-T", or equal. Protection devices for full period circuits shall be Transtector "LMP Series", Northern Technologies "DLP-S Series", Phoenix Contact "TeleTrab Series", or Circuit Components, Inc. "SPR-TM Series."
- F. Power Wiring. Power distribution wiring on the line side of panel fuses shall be minimum 12 AWG. Secondary power distribution wiring and wiring for control circuits shall be minimum 14 AWG. Wiring for ac power distribution, dc power distribution, and control circuits shall have different colors and shall agree with the color-coding legend on System Supplier's panel wiring diagrams. With the exception of electronic circuits, all interconnecting wiring and wiring to terminals for external connection shall be stranded copper, insulated for not less than 600 volts, with a moisture resistant and flame retardant covering rated for not less than 90°C.
- G. Backup Power. All panels furnished under this section, and under other specification sections referring to this section, that contain a PLC shall each be provided with an uninterruptible power supply (UPS) to provide backup power in the event of loss of utility power to the enclosure. The UPS shall be DIN rail mounted or supported by a dedicated shelf attached to the enclosure's backplane or sidewall. The shelf shall be between 12 and 18 inches from the bottom of the enclosure and shall not be directly above any electronic or electromechanical devices.

Backup power shall be provided to the PLC CPU, instrument loops, I/O modules (operating and wetting voltages) and all network communications devices. Backup power for panel interior lights, heaters, and convenience receptacles is not required.

Uninterruptible power supplies shall meet the following requirements.

1. Uninterruptible Power Supplies. Each UPS shall accept incoming 120 Vac, single-phase utility power and supply power to the connected loads. The UPS shall be a double-conversion ("on-line") type to provide a breakless transfer to backup power. In the event of incoming power failure, the UPS shall provide 120 Vac, single-phase power to its connected loads by inverting power stored within integral storage batteries. Upon restoration of incoming power, the UPS shall recharge the batteries and return its connected loads to the incoming power source. The UPS output shall be connected by plug and line cord to terminal blocks as necessary to distribute power to loads fed from the UPS output.

The UPS shall maintain a temperature-compensated, float charge voltage on the batteries when utility power is available to the UPS. Overcurrent protection when utility power is available shall be from a circuit breaker internal to the UPS. The UPS shall be intrinsically current-limiting when the unit is on battery.

The UPS shall meet the following requirements.

Capacity, minimum - 1000 VA

Compliance – UL 1778 and UL 508 (without derating)

Voltage, output (on battery) - 120 volts ± 5 percent

Frequency, output (on battery) - 60 ± 0.3 Hz

Operating environment - 0 to 50°C; 0 to 95 percent relative humidity, non-condensing

Backup time, minimum at half load - 10 minutes

Recharge time, maximum - 8 hours to 90%

The UPS shall have an ON/OFF/TEST button, a visual status indicator for low (or faulty) battery, a visual status indicator for AC Power Normal, and a visual status indicator for On Battery Power.

Batteries shall be sealed maintenance-free, gelled electrolyte lead-acid, or valve-regulated, maintenance-free, lead-acid. Flooded-electrolyte type batteries will not be acceptable.

The UPS shall be Sola-S4K2U1000D or equal.

- H. Terminal Blocks. Terminal blocks for external connections shall be suitable for 12 AWG wire and shall be rated 30 amperes at not less than 300 volts. Terminal blocks shall be fabricated complete with marking strip, covers, and pressure connectors. Terminals shall be labeled to agree with identification shown on the supplier's submittal drawings. A terminal shall be provided for each conductor of external circuits, plus one ground for each shielded cable. Not less than 8 inches of clearance shall be provided between the terminal strips and the base of vertical panels for conduit and wiring space. Not less than 25 percent spare terminals shall be provided. Each control loop or system shall be individually fused, and all fuses or circuit breakers shall be clearly labeled and located for easy maintenance.
- I. Circuit Breakers. All circuit breakers provided shall be 3 pole, 600V rated with a short circuit interrupting rating of 10 kAIC.

Where the electrical power supply voltage to the control panel is greater than 120 Vac, provide the panel with a door-mounted disconnect handles operating a molded case circuit breaker. Mechanically interlocked the disconnect switch with the control enclosure doors so that no door can be opened unless the power is disconnected, and the disconnect switch cannot be closed until all doors are closed. Provide means to defeat the interlock.
- J. Panel Mounted Ethernet Switches. Panel mounted ethernet switches shall be Cisco IE-4000-8GT8GP4G-E. No other product will be accepted. Equip all combo ports as fiber optic terminals.
- K. Fiber Optic Termination Cabinets (FOTC) / Fiber Optic Patch Panels (FOPP). Where indicated on the Drawings, Fiber optic termination cabinets (also commonly referred to as patch panels) shall be furnished to terminate fibers at the Fiber Optic Modules, and any other data highway attached equipment. The cabinets shall meet the following requirements:

The termination cabinet shall be the wall-mounted type, having provisions for terminating multiple fiber optic cables. Splice trays, strain relief cable attachment points, fiber organizers and bend radius hardware shall be furnished with each termination cabinet.

Panel size shall be suited to the number of fibers to be terminated within the cabinet. Bayonet/flanged couplings shall be furnished and mounted for each fiber to be terminated.

Fiber terminations shall be spliced to pigtail cables having SC connectors. The pigtails shall be terminated in an orderly method.

- L. Panel Ventilation. Provide filtered intake louvers, thermostat, and exhaust fan in enclosure to extract heat generated from equipment installed within panel. Ventilation shall be sized to maintain temperature within equipment operating parameters. Filters shall be replaceable.
- M. Variable frequency Drives. Provide as per Specification Section 16160.
- N. Control Transformer. Furnish 480 or 208 volt to 120-volt control transformer in pump control panel to provide 120 Vac control power. Size transformer to power connected devices and protect with primary and secondary circuit breakers and one secondary lead shall be grounded.
- O. Device Tag Numbering System. All devices shall be provided with permanent identification tags. The tag numbers shall agree with the Instrument Device Schedule and with the supplier's equipment drawings. All field-mounted transmitters and devices shall have stamped stainless steel identification tags. Panel, subpanel, and rack-mounted devices shall have laminated phenolic identification tags securely fastened to the device. Hand-lettered labels or tape labels will not be permitted.
- P. Nameplates. Nameplates shall be provided on the face of the panel or on the individual device. Panel nameplates shall have approximate dimensions and legends, as indicated on the drawings, and shall be made of laminated phenolic material having engraved letters approximately 3/16 inch high extending through the black face into the white layer. Nameplates shall be secured firmly to the panel. Panel face nameplates do not replace the requirement for device identification tags as specified under the Device Tag Numbering System paragraph.
- Q. Factory Test. Panels shall be factory tested electrically by the panel fabricator before shipment.

2.3 PANEL FRONT MOUNTED DEVICES

- A. Digital Panel Indicators. Digital Panel Indicators shall be Siemens SITRANS RD200 or approved equal. 0.5 inch LED display. Panel front programming. 120 Vac supply power. 4-20 mA input. Two (2) Form C programmable contacts. NEMA 12 level of protection. 0 to 65°C operating temperature.
- B. Selector Switches. Selector switches shall be heavy-duty, oil-tight type with gloved-hand or wing lever operators. Position legends shall be engraved on the switch faceplate. Switches for electric circuits shall have silver butting or sliding contacts, rated 10 amperes continuous at 120 Vac. Contact configuration shall be as indicated on the drawings or for the application. Switches used in electronic signal circuits shall have contacts suitable for that duty. Switches shall be Cutler-Hammer "Type T", General Electric "CR", Micro Switch "Type PT", or Allen Bradley "800T".
- C. Indicating Lights. Indicating lights shall be heavy-duty, oil-tight type, with low voltage LEDs.

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A built-in transformer shall be used for ac service. Legends shall be engraved on the lens or on a legend faceplate. Lights shall be push-to-test type. Indicating lights shall be Cutler Hammer "Type T", General Electric "CR", Micro Switch "Type PT", or Allen Bradley "800T".

- D. Push Buttons. Push buttons shall be heavy-duty, oil-tight type. Legends shall be engraved on the push-button faceplate. Contacts shall be rated 10 amperes continuous at 120 V ac. Push buttons shall be Cutler-Hammer "Type T", General Electric "CR", Micro Switch "Type PT", or Allen Bradley "800T".
- E. Elapsed Time Meters. Time totalizer type. Furnish synchronous motor to drive set of digit readout wheels to indicate total time pump motor starter is energized. Readout: Six-digit including 1/10 digit. Range: 0 to 99999.9 hours. Voltage Rating: 120 volts.
- F. Alarm Horn and Beacon. Alarm horns and beacons shall be furnished as indicated on the Drawings. The beacon shall be 120 Vac, strobe light with red lens and acrylic dome, Edwards "Model No. 94G-N5" or Federal Signal "Model 371 DST". The alarm horn shall be 120 Vac, weatherproof horn, Edwards "Model No. 876-N5" or Federal Signal "Model 350WB".

2.4 PANELS

- A. Panel Construction. Panel construction shall be as shown on the Equipment Schedule. Panels shall be completely enclosed cubicles formed from steel structural members and steel plates. The base shall be formed of steel channels, with flanges extending upwards. The base shall be provided with 1/2-inch diameter holes at 12 inch centers so that the base can be bolted to the concrete equipment base. Welds, seams, and edges on all exposed surfaces shall be ground smooth. Suitable lifting facilities shall be provided for handling and shipment.
- B. Structure. Panel structure shall be suitably braced and of sufficient strength to support all equipment mounted on or within, to withstand handling and shipment, to remain in proper alignment, and to be rigid and freestanding.

Top, sides, and back shall be fabricated from USS 10 gage or heavier steel sheets, with stationary back suitable for back to wall installation, or designed for rear access with hinged back doors. Rear access doors shall be fabricated from USS 14 gage or heavier steel.

- C. Panel Front. The front shall be a hinged door, or doors, with mounted instruments and control devices, fabricated from USS 10 gage steel sheet, suitably braced and supported to maintain alignment. Panels with hinged fronts shall be of sufficient width to permit door opening without interference with rear projection of flush mounted instruments. When indicated on the Drawings and / or in the attached Equipment Schedules, a full, hinged, inner door shall be provided for mounting OIT's, indicating lights, switches, etc. Where an inner door is indicated the outer door shall have no instruments or devices mounted on it and shall provide the NEMA rating required for the panel and shielding (from sunlight and weather) for the instruments and devices mounted on the inner door.
- D. Doors. Doors shall be essentially full height, having turned back edges and additional bracing to ensure rigidity and prevent sagging. Doors shall be mounted with strong, continuous, piano type hinges. 3-point positive latches, acting from a common door handle, shall hold doors securely compressed at top, side, and bottom against rubber gaskets.
- E. Legs. Freestanding Vertical Panels shall be supplied with 12-inch high legs constructed of the

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same material as the panel enclosure when indicated on the Drawings and / or the attached Equipment Schedules.

- F. Size and Arrangement. Panel dimensions and general instrument arrangement shall be as indicated on the Drawings and the attached Equipment Schedules.

PART 3 - EXECUTION

- 3.1 GENERAL INSTALLATION REQUIREMENTS. Installation requirements are specified in the Instrumentation and Control System section. In addition, equipment furnished under this section shall conform to the following manufacturing stipulations.
 - A. Piping. All tubing shall be run in horizontal and vertical planes and shall be rigidly supported to withstand handling and shipment. Flexible polyethylene tubing shall be used to connect devices mounted on hinged doors.
 - B. Wiring. All wiring shall be grouped or cabled and firmly supported inside the panel. Wiring shall be bundled in groups and routed in Panduit or similar nonmetallic slotted ducts. Ducts shall be readily accessible within the panel with removable covers and shall have a space of at least 40 percent of the depth of the duct available for future use after installation is complete and all field wiring installed. Sufficient space shall be provided between cable groups or ducts and terminal blocks for easy installation or removal of cables.
 - C. More Than One Panel. Where signal or loop wiring must be routed to more than one panel or device, the required circuit routing shall be as indicated on the one-line diagrams. The panel fabricator shall provide such additional circuits as may be indicated on the electrical schematic drawings.

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EQUIPMENT SCHEDULE 13570-S01

PANEL SCHEDULE

Tag Number(s)	LCP Niagara	LCP-1 LCP-2 LCP-3
Associated Equipment Specification Sections	13500 13530 13562	11140 16160
Panel Name(s)	Programmable Logic Controller Panel	Pump 1 Control Panel Pump 2 Control Panel Pump 3 Control Panel
NEMA Type Enclosure	Type 12	Type 12
Material	Steel	Steel
Dimensions (minimum)	72" High 42" Wide 18" Deep	72" High 36" Wide 18" Deep
Inner Doors Required	No	No
Legs Required	Yes	Yes
PLC Inside	Yes	No
UPS Inside	Yes	No

END OF SECTION 13570

SECTION 13591 – FIBER OPTIC COMMUNICATION CABLE AND APPURTENANCES

PART 1 - GENERAL

- 1.1 Under this item the Contractor shall install, and test a fiber optic communications system at the locations shown on the plans, as directed by the Engineer, and as specified herein. This work shall consist of furnishing and installing single mode fiber optic cable used for the communications backbone, distribution network and equipment drops, passive components and miscellaneous equipment necessary for a complete cable plant as shown in the plans and as directed by the Engineer.
- 1.2 Manufacturer Experience: The fiber optic system components to be furnished shall be the products of manufacturers with a minimum of five (5) years experience in the successful manufacturing of such components. The fiber manufacturer and cabler shall be ISO 9001 certified.
- 1.3 Installer Experience:
 - A. The installer of the fiber optic system shall be established in the installation of such equipment and shall have installed, as a minimum, three (3) systems of this magnitude, with each system having been in satisfactory operation for a minimum of five (5) years.
 - B. The installer shall provide the names, addresses, and telephone numbers of references who can be contacted regarding these systems.
 - C. The Contractor shall submit as proof resumes of the personnel listing their names, addresses, telephone numbers and project worked on and the names of references who can be contacted regarding the installed fiber optic systems. Personnel shall meet the following requirements:
 1. Splicers shall have been trained and certified in fiber optic cable installation and handling procedures by the manufacturer of the fiber optic cable to be used.
 2. Installers shall have been trained and certified in fiber optic cable installation and handling procedures by the manufacturer of the fiber optic cable to be used.
 3. Personnel involved in testing shall have been trained and certified by the manufacturer of the fiber optic cable test equipment to be used, in fiber optic cable testing procedures.
 4. Proof of the appropriate training shall be submitted to the Engineer for approval a minimum of twenty (20) working days prior to start of installation.
- 1.4 Existing Fiber Optic System: The fiber optic system provided under this specification shall connect with existing fiber optic cable if so indicated in the plans. The Contractor shall be responsible for testing the existing fiber prior to splicing into it. When splices are complete, the Contractor shall perform end-to-end testing, inclusive of the existing fiber.

PART 2 - PRODUCTS

- 2.1 General Description of Materials and Services: The fiber optic communications system to be provided under this specification consists of the following major components:

- A. Fiber Optic Drop (Distribution) Cable
- B. Fiber Optic Splice Enclosures
- C. Submittals and Documentation
- D. Testing.

The Trunk Cable shall interconnect the head-end communication equipment with the field communication equipment. The Drop Cable shall interconnect the Trunk Cable with the Patch panel in cabinets. The Fiber Optic Patch Cord Cable shall interconnect the Drop Cable with the communication equipment in cabinets.

The quantity of fibers contained in each cable shall be in accordance with the plans.

All work shall be done in accordance with the manufacturer's recommendations, the Contract Documents, and as ordered by the Engineer.

- 2.2 Number of Fibers: The number of single mode fiber specified for each cable as shown in the Contract Drawings shall be the guaranteed minimum number of fiber (i.e., minimum number of fibers in the cable which when installed shall comply with the specification). If no fiber count is shown, the number of fibers shall be six (6).

- 2.3 Fiber Optic Drop Cable:

- A. The single mode fiber optic cable shall incorporate a water swellable tape, loose buffer tube cable design. The fiber optic cable shall be suitable for installation in conduit or lashed to messenger cable in an outside cable plant environment. The cable shall be all dielectric and shall consist of the number of fibers specified in the plans.
- B. The cable shall meet the following requirements:
 - 1. United States Department of Agriculture Rural Utility Service (RUS) 7 CFR1755.900
 - 2. The requirements of ANSI/ICEA Standard for Fiber Optic Outside Plant Communications Cable,
 - 3. ANSI/ICEA S-87-640-1999
 - 4. ITU-T G.652 (Categories A,B,C, & D)
 - 5. TIA/EIA 492-CAAB
 - 6. Telcordia GR-20

C. The cable shall meet the following requirements:

1. Optical Requirements: The fiber shall meet the requirements of EIA/TIA-492CAAA “Detail Specification for Class IVa Dispersion – Unshifted Single-Mode Optical Fibers”:

Attenuation: The nominal attenuation shall not exceed 0.4 dB/km at a wavelength of 1310 nm and 0.3 dB/km at a wavelength of 1550 nm. Fiber attenuation shall be uniform with no discontinuities greater than 0.1 dB. The attenuation at 1383 ± 3 nm shall not exceed 2.1 dB/km. The attenuation measurements shall be in accordance with EIA/TIA Standards FOTP-20, 59, 61 and 78. The average change in attenuation at extreme operational temperatures (-76°F to 185°F) shall not exceed 0.05 dB/km at 1550 nm. The magnitude of the maximum attenuation change of each individual fiber shall not be greater than 0.15 dB/km at 1550 nm. The change in attenuation measurements shall be in accordance with EIA/TIA Standard FOTP-3.

Cutoff Wavelength: Not to exceed 1260 nm.

Mode-Field Diameter:

$9.20 \pm 0.4 \text{ }\mu\text{m}$ at 1310 nm.

$10.4 \pm 1.00 \text{ }\mu\text{m}$ at 1550 nm.

Zero Dispersion Wavelength: 1313 nm.

Zero Dispersion Slope: Not to exceed $0.086 \text{ ps}/(\text{nm}^2 \bullet \text{km})$.

Polarization Mode Dispersion: Not to exceed $0.2 \text{ ps}/\text{km}^{1/2}$.

Dispersion: Less than $3.5 \text{ ps}/(\text{nm} \bullet \text{km})$ for 1285 nm through 1330 nm and less than $18 \text{ ps}/(\text{nm} \bullet \text{km})$ at 1550 nm as measured in accordance with EIA/ TIA Standard FOTP-169.

2. Mechanical Requirements:

Fibers: All optical fibers shall be Corning glass fibers (SMF28e) or approved equivalent. All fibers within a given cable shall be from the same manufacturer, and shall contain no factory splices. Each fiber shall conform to the following minimum requirements:

Typical Core Diameter: $8.2 \text{ }\mu\text{m}$

Cladding Diameter: $125 \pm 0.7 \text{ }\mu\text{m}$

Core-to Cladding Offset: Not to exceed $0.5 \text{ }\mu\text{m}$

Cladding Non-Circularity: Not to exceed 0.7%.

Color Coating: Each fiber shall have a color coating applied to it by the manufacturer. The coating shall not affect the optical characteristics of the fiber. The basic color

configuration shall be as follows, in accordance with EIA/TIA-598-A:

1) Blue	5) Slate	9) Yellow
2) Orange	6) White	10) Violet
3) Green	7) Red	11) Rose
4) Brown	8) Black	12) Aqua

The nominal colored fiber diameter shall be 250 Φ m.

Primary Coating: Each fiber shall have a dual layered, UV acrylate coating applied to it by the manufacturer. The coating shall be mechanically strippable without damaging the fiber. The coating diameter shall be $245 \pm 5 \Phi$ m.

Central Strength Member: The strength member shall consist of a dielectric, glass-reinforced plastic rod.

Buffering: All fibers shall be enclosed in non-conductive loose buffer tubes. Each buffer tube shall contain twelve (12) fibers. The Contractor shall submit the fiber count per buffer tube and the buffer tube count configuration to the Engineer for approval. The fiber shall not adhere to the inside of the buffer tube. Each buffer tube containing fibers shall be color coded in a similar scheme as the fiber color. The basic color configuration shall be as follows, in accordance with EIA/TIA-598-A:

1) Blue	5) Slate	9) Yellow
2) Orange	6) White	10) Violet
3) Green	7) Red	11) Rose
4) Brown	8) Black	12) Aqua

Cables requiring additional buffer tubes (greater than 144 strand) shall follow the same color scheme, except dashed.

In buffer tubes containing multiple fibers, the colors shall be stable during temperature cycling and not subject to fading or smearing onto each other or into the gel filling material. Colors shall not cause fibers to stick together. Buffer tubes shall be of dual-layer construction.

The buffer tubes shall be filled with a non-hygroscopic gel to prevent water and moisture penetration. The gel shall contain anti-oxidant additives, and the gel shall be readily removable with conventional solvents. The gel shall be non-toxic and dermatologically safe to exposed skin. It shall be chemically and mechanically compatible with all cable components, non-nutritive to fungus, and electrically non-conductive.

Filler Rods: Fill rods shall be used to fill all unused buffer tubes, or shall be used instead of unused buffer tubes. The filler rod shall be a solid polyethylene material

and shall be natural in color. The filler rods shall maintain the concentricity of the cable cross section where required.

Stranding: The buffer tubes shall be stranded around the central strength member using the reverse oscillation (S-Z) stranding process. Water swellable yarns shall be applied longitudinally along the central member during stranding.

Water Swellable Tape: A water swellable tape shall be applied longitudinally over the stranded tubes/fillers. The water swellable tape shall be non-nutritive to fungus, electrically non-conductive and homogenous. It shall also be free from dirt and foreign matter.

Tensile Strength Provisions: Aramid yarn shall be helically stranded evenly around the cable core to provide tensile strength. The yarn shall enable the cable to withstand a maximum pulling force of 600 lb. during installation and 200 lb. long term installed without changing the characteristics of the optical fibers. Each length of cable shall have sufficient strength to be installed in continuous lengths as specified on the plans.

Outer Jacket: A medium density polyethylene (or approved equal) outer jacket shall be applied over the entire cable assembly. The outer jacket shall have a minimum nominal jacket thickness of 1.25 mm. The polyethylene shall contain carbon black and shall not promote the growth of fungus. Jacketing material shall be applied directly over the strength members and the water swellable tape. The outer jacket shall contain no metallic elements and shall be of a consistent thickness.

The MDPE jacket material shall be as defined in ASTM D1248, Type II, Class C and Grades J4, E7 and E8.

Markings: The outer cable jacket shall have sequential length markings in feet. The actual length of the cable shall be within $\pm 1\%$ of the length markings. The marking shall be in a contrasting color to the cable jacket. The height of the marking shall be approximately 2.5 mm.

The jacket shall be marked in contrasting color at three (3) foot intervals with the following information:

Name of Cable Manufacturer

Manufacturer's Catalog Number that includes information on type of fiber and fiber count

NYSTA FIBER OPTIC CABLE – YYYY, where YYYY shall be the year that the cable was manufactured.

Ripcord: The cable shall contain a ripcord under the sheath to facilitate cable preparation.

Bend Radius: The cable shall be capable of withstanding a minimum bending radius of ten (10) times its outer diameter during operation and fifteen (15) times its outer diameter during installation without changing the characteristics of the optical fibers.

Fish Line: Fish line shall be nylon or polypropylene material with a minimum test strength of 90 lb.

3. Manufacturer's Certification: The cable manufacturer shall certify that each reel of cable furnished, meets or exceeds all of the optical and mechanical requirements mentioned above, plus the following specifications:

Fluid Penetration: When a three (3) foot static head of water or equivalent continuous pressure is applied at one end of a three (3) foot length of filled cable for one (1) hour, no water shall leak through the open cable end. The water penetration testing shall be performed in accordance with EIA/TIA Standard FOTP-82.

Filling Compound Flow: When tested in accordance with EIA/TIA Standard FOTP-81, the cable shall exhibit no flow (drip or leak) of filling or flooding compound at 160°F.

Compressive Strength: When tested in accordance with EIA/TIA Standard FOTP-41, the cable shall withstand a minimum compressive load of 22N/mm applied uniformly over the length of the sample and applied at the rate of 2.5 mm per minute. The load shall be maintained for a period of one (1) minute and then decreased to 110N/cm. The 110N/cm load shall be maintained for a period of ten (10) minutes. Attenuation measurements shall be performed before release of the 16 psi load. The change in attenuation shall not exceed 0.15 dB at 1550N/cm.

Tensile Loading and Bending: When tested in accordance with EIA/TIA Standard FOTP-33, using a maximum mandrel and sheave diameter of 22 inches, the cable shall withstand a rated tensile load of 600 pounds and a residual load of 30% of the rated installation load. The axial fiber strain shall be 20% of the fiber proof level after completion of ten (10) minutes of conditioning and while the cable is under the residual load. The change in attenuation at residual load and after load removal shall not exceed 0.15 dB at 1550 nm.

Impact Resistance: When tested in accordance with EIA/TIA Standard FOTP-25, except that the number of cycles shall be two at three locations along a three (3) foot cable length and the impact energy shall be at least 4.4Nm (in accordance with ICEA S-87-640), the change in attenuation shall not exceed 0.15 dB at 155 nm.

Cable Flex: When tested in accordance with EIA/TIA Standard FOTP-104, the cable shall withstand 25 mechanical flexing cycles around a sheave diameter not greater than 20 times the cable diameter. The fibers shall not experience an attenuation change greater than 0.15 dB at 1550 nm. The cable jacket shall exhibit no cracking or splitting when observed under 5X magnification.

Temperature Cycling: When tested in accordance with EIA/TIA Standard FOTP-3, the change in attenuation at extreme temperatures (-76°F to +185°F) shall not exceed 0.05 dB/km at 1550 nm.

Low or High Temperature Bending: When tested in accordance with EIA/TIA Standard FOTP-37, the cable shall withstand four full turns around a mandrel of 20 times the cable diameter for four (4) hours at test temperatures of -22°F and +140°F. Neither the inner or outer surfaces of the jacket shall exhibit visible cracks, splits, tears

or other openings. The fibers shall not exhibit a change in attenuation greater than .30 dB/km at 1550 nm.

Cable Twist: When tested in accordance with EIA/TIA Standard FOTP-85, a length of cable no longer than six (6) feet shall withstand 10 cycles of mechanical twisting. The fibers shall not experience an attenuation change greater than 0.1 dB at 1550 nm. The cable jacket shall exhibit no cracking or splitting when observed under 5X magnification.

- D Packing and Shipment. All fiber cable shall be supplied on reels. Each reel shall have the following information clearly labeled on it:

Customer

Customer order number

Reel number

Destination

Ship date

Manufactured date (glass and cable)

Manufacturer's name (glass and cable)

Cable code

Length of cable.

2.4 Splice Enclosures.

- A. The Contractor shall furnish and install fiber optic Splice Enclosures in locations where splices require protection and as indicated in the plans. The Splice Enclosures shall meet the following minimum requirements:
1. The Outdoor Splice Enclosure shall be suitable for outdoor applications with a temperature range of -22°F to 140°F.
 2. The Outdoor Splice Enclosure shall be sized for placement as shown in the Contract Drawings and shall provide sufficient space to allow entry of fiber optic cable without exceeding the cable minimum bending radius.
 3. The Outer Enclosure shall protect the splices from moisture and mechanical damage and shall be resistant to salt corrosion. All materials in the enclosure shall be non-reactive and shall not support galvanic cell action.
 4. The enclosure shall be waterproof, re-enterable and shall be sealed with a gasket.
 5. The enclosure shall permit selective splicing to allow one (1) or more fibers to be cut and spliced to the Drop Cable without disrupting other fibers.

6. The outer enclosure shall have strain relief for the Trunk Cable to prevent accidental tension from disturbing the splices.
 7. When installed, the case shall be capable of withstanding severe conditions of moisture, vibration, impact, cable stress and temperature extremes.
 8. The case shall be capable of holding the type of splice trays specified herein, for fusion splices. The case shall have the capability of holding trays from various manufacturers.
 9. The basic case shall have the input/output capacity of four (4) cables.
 10. The case shall be re-enterable without disturbing the fibers or the fiber splices. No special tools shall be required for installation of maintenance of the case. All hardware and miscellaneous parts shall be standard industry equipment.
 11. The splice case shall be mountable to standard U-shaped sign channels using stainless steel hardware, or manufacturer approved hardware. Mounting shall be as shown on the details.
 12. The splice case shall have a termination block to terminate the central strength members of the fiber optic cables.
- B. Splice Trays. The Contractor shall furnish and install fiber optic splice trays to organize and store splices. The trays shall be compatible with the fiber optic splices and Splice Enclosures specified herein and shall meet the following minimum requirements:
1. The Splice Tray shall be compatible with the outer enclosure and be constructed of rigid plastic or metal. The number of Splice Trays per enclosure shall accommodate the number of splices required under the Contract.
 2. Polyethylene tubes shall be supplied to protect exposed individual fibers within the enclosure.
 3. Vinyl markers shall be supplied to identify each fiber to be spliced within the enclosure.
 4. Each splice shall be individually mounted and mechanically protected on the splice tray.
 5. The loose tube buffers shall be secured with a tube guide or channel snap. No cable ties are to be used.
 6. Slack fiber within the tray shall be placed in an oval shape along an inside wall of the tray.
 7. The fiber optic splice trays shall be stackable within the splice case. Any tray within a stack shall be accessible without disassembly of any of the other trays.
- C. Fiber Optic Breakout Kits: The fiber optic breakout kits contain all the tools and materials necessary to complete the installation of the fiber optic backbone and Drop Cables. It shall

include, as a minimum, the following equipment:

1. Pulling eyes with protective covering for the installation of pre-terminated fiber optic Drop Cable.
2. Fiber optic installer test equipment, fusion splicers, test cables, connector adapters, inspection tools, attenuators, tracers, continuity checkers, consumables and all ancillary equipment.

PART 3 - EXECUTION

- 3.1 General: All fiber optic cable will be installed in innerduct, steel, or PVC conduit as indicated in these Contract Documents or otherwise directed by the Engineer. All fibers in the fiber optic cable shall be spliced and/or terminated in designated field cabinets or pull boxes only.
- 3.2 Design Documentation: Prior to the installation of the fiber optic cable, the Contractor shall submit his proposed cable plant design to the Engineer for approval. No cable shall be installed until the proposed cable plant design submission is approved by the Engineer. The cable plant design shall include the following:
 - A. Catalog cuts and shop drawings for all cable, connectors, splice equipment, Splice Enclosures, splice trays, Patch Panels, jumper cables, wall mounted cabinets, and cable installation and test equipment.
 - B. Preliminary locations of all proposed splices.
 - C. Preliminary fiber assignment diagrams.
 - D. Fiber attenuation/loss budget. The Contractor's loss budget shall include losses for any existing fiber that is to be connected to under this Contract. The existing losses shall be obtained from the as-built documentation from the existing fiber plant. If this information is not available to the Contractor, the loss budget for existing fiber shall be determined later from testing done in Section 3.10 A. of this Specification.
 - E. Proposed pull box locations where hand assists or intermediate assist winches will be required during installation.
 - F. Proof of the experience requirements as defined in this special specification.
 - G. Cable manufacturer's recommended cable installation techniques and requirements such that the optical and mechanical properties of the cables are not degraded at the time of installation.
 - H. The cable manufacturer's proposed recommendations shall include the following (that apply to this project):
 1. Cable manufacture's approved pulling lubricant for use on the cable and method of application. No other lubricants will be permitted.
 2. Installation set-up including size and types of rollers, feeder guides, tension gauge

make and model number, attachment of pulling jig to jacket and direction to pull.

3. Maximum pulling tensions, which shall specify both pulling from the cable's conductors and for pulling from the cable's outer jacket.
4. Minimum bend radii, which shall specify a radius both loaded and unloaded.
5. Method to install multiple cables.

3.03 Splicing Requirements: All optical fibers shall be spliced to provide continuous runs. Splices shall be allowed only at locations designated in the approved cable plant layout or as approved by the Engineer. All splices shall be performed in a controlled, clean environment such as a Contractor designated splicing truck or van.

The splices shall meet the following requirements:

- A. All splices shall use the fusion technique. Fusion splicing equipment shall be provided by the Contractor and shall be cleaned, calibrated and specifically adjusted to the fiber and environmental conditions at the start of each shift. Splice enclosures, tools and procedures, shall be approved by the cable manufacturer as being compatible with the cable type being delivered.
 - B. Only buffered tubes containing fibers to be spliced shall be opened. The other tubes shall be neatly looped and stored in the enclosure. When buffer tubes do not need to be opened, at least 4 m of unopened buffer tube shall be coiled in the fiber optic Splice Enclosure. Unsevered fibers in an open fiber buffer tube shall be neatly coiled in the splice tray.
 - C. Each spliced fiber shall be packaged in a protective sleeving or housing. Bare fibers shall be completely re-coated with a protective RTV, gel or similar substance, prior to application of the sleeve or housing, so as to protect the fiber from scoring, dirt or micro bending.
 - D. Rack mounted organizer trays shall be used to hold the spliced fibers, with each fiber neatly secured to the tray.
 - E. The average splice loss shall not exceed 0.1 dB per link, with a standard deviation of no more than 0.07 dB. A link is defined as the fiber optic path between two (2) active components. No splice loss shall exceed 0.15 dB. If a splice is measured to exceed 0.15 dB during the splicing process, it shall be remade until its loss falls below 0.15 dB or the Engineer waives the 0.15 dB requirement. Each attempt shall be recorded for purposes of acceptance. If the mean exceeds 0.1 dB in any link, splices in the link shall be remade until the mean loss does not exceed 0.1 dB.
 - F. All splice losses shall be recorded in tabular form and submitted to the Engineer in electronic format for approval. If an optical time domain Reflectometer (OTDR) is used to record splice loss, chart recordings of the "signature" shall be submitted with the splice data with a record of all OTDR settings and the OTDR locations written on the trace.
 - G. At butt-end connections, all optical fibers shall be spliced to provide continuous runs.
- 3.04 Cable Installation: Fiber optic cable shall be installed in accordance with the approved manufacturer's recommendations. In addition, the following requirements shall be met:
- A. Prior to any installation of cable, the Contractor shall verify that conduits are clean and free of

obstructions.

- B. The number of pull boxes and their locations shall be as shown on the Contract Documents. The Contractor may be required to install the cable one pull box at a time. The direction of the cable pull shall be determined by the Contractor.
- C. Personnel equipped with two (2) way radios shall be stationed at each maintenance hole, cabinet, Splice Enclosure, communications box and junction box through which the cable is to be pulled to observe and lubricate the cable.
- D. Fish line shall be installed in all communications ducts or conduits along with fiber optic communication cables. A six (6) foot length of fish line shall be left coiled, tied and accessible in each cabinet and pull box. The fish line shall be installed according to manufacturer's specifications and shall be "free" and NOT helicoil about communications cables.
- E. A minimum of 30 feet of cable slack shall be provided in pull boxes containing splices or otherwise designated on the Contract Documents or as directed by the Engineer. Additional slack, as indicated on the approved cable installation plan, may be provided for closure preparation and splicing.
- F. The cable shall be securely fastened in place within Splice Enclosures and cabinets to prevent pull-out or shifting of the cable.
- G. The Contractor shall be responsible for ensuring the cable length is sufficient to allow for connection between the communication equipment and the Splice Enclosures including provision for slack, vertical runs, cable necessary for splicing, wastage and cable to allow for the removal of the Splice Enclosure for future splicing.
- H. No fiber optic cable shall be pulled through more than one (1) 90 degree bend unless so indicated on the approved Contract Documents or specifically approved by the Engineer.
- I. The cable shall not be pulled over edges or corners, over or around obstructions, or through unnecessary curves or bends.
- J. The cable shall be looped in and out of cabinets and pull boxes to provide adequate slack and the least amount of stress on the fibers. The Contractor shall ensure that the cable is not damaged during storage or installation.
- K. Fiber optic cable ends shall be kept sealed at all times during installation, using a method recommended by the cable manufacturer and approved by the Engineer. The cable end shall remain sealed until the Contractor terminates the fiber cables. Cables that are not immediately terminated shall have a minimum of six (6) feet of slack.
- L. When using lubricants, the Contractor shall adhere to the cable manufacturer's requirements for the proper amount, application tools and method, and removal of the lubricant from the exposed cable.
- M. Optical fiber cable shall be installed in continuous lengths without intermediate splices throughout the project except where splices are indicated on the Contract Documents or approved by the Engineer. Splices shall only be in re-enterable Splice Enclosures mounted in pull boxes, junction boxes and underground vaults.

- N. The fiber optic Drop Cable shall be spliced to the backbone cable at the locations indicated in the Contract Documents or as directed by the Engineer.
 - O. The maximum pulling tensions and minimum bending radii shall not be violated at any time during installation. The Contractor shall consult with the Engineer concerning existing conduit, pull boxes, and rises, which could force the violation of the minimum bending radius for the fiber optic cable. The Contractor shall obtain approval from the Engineer if modifications to these existing facilities are required. Violation of these parameters shall be cause for rejection of the installed cable.
 - P. Following installation of the cable in the ducts, all duct entrances at Splice Enclosures and cabinets shall be sealed with an innerduct termination plug (provided under separate pay item) or a duct sealing compound (if plugs are not provided under separate pay item) to prevent the ingress of moisture, foreign materials, and rodents.
 - Q. Where Trunk Cable terminations are left “dead ended”, a minimum of 80 feet of cable shall be left coiled.
 - R. Slack cable and innerduct where pulled through a pull box shall be racked to the pull box wall.
- 3.05 Drop Cable:
- A. Drop cables that go to multiple Patch Panels shall be looped through intermediate cabinets and panels such that fibers not needed at that particular site pass through, splice free and uncut. The Drop Cable fiber shall be fusion spliced to the appropriate trunk fiber or left in a splice tray for future use as indicated in the drawings. The other end of the fiber shall be fusion spliced to a connector fan-out kit and mounted in the Patch Panel. Field installed connectors shall not be used without written consent of the Engineer and shall be reviewed on a site by site basis. The Contractor, at his option may propose to provide factory installed connectors on the Patch Panel side for distribution cable runs that go to only one cabinet or Patch Panel. If Drop Cable is provided with factory installed connectors, the manufacturer shall factory test the cable assembly and provide the results to the Engineer for approval.
 - B. The Drop Cable shall be of sufficient length to be installed as shown on the plans, with a minimum of 10 feet of slack provided on either end or as indicated in the drawings.
 - C. The Contractor shall follow the Drop Cable manufacturer’s recommendation in the installation of the Drop Cables, including the individual breakout fibers.
- 3.06 Splice Enclosures:
- A. Splice enclosures shall be installed in accordance with the manufacturer’s recommendation and as directed by the Engineer. After final assembly of the Splice Enclosure, it shall be pressure tested in accordance with the manufacturer’s recommendations. If the pressure test is not passed, the enclosure shall be resealed and the test repeated. The Engineer shall be notified of any failed attempts and shall reserve the right to reject the Splice Enclosure and any others with similar problems.
 - B. The Contractor shall submit the test results to the Engineer for approval and acceptance of the enclosure.

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3.07 Patch Panel/Panel:

- A. All Drop Cables entering a cabinet shall connect to a Patch Panel.
- B. Fiber optic splitters and taps (FOS's and FOT's) shall be housed within the cavity of the Patch Panel.
- C. All fiber optic patch cord cables between the Patch Panel and Fiber Optic Communication Equipment shall exit the Patch Panel via the Interconnect Panel.
- D. The unused ports of the Interconnect Panel shall be provided with dust jackets for protection.

3.08 Wall Mounted Fiber Splice Boxes: At the Trunk Cable terminus, within a building, cables shall be installed in Wall Mounted Splice Boxes as indicated in the Contract Drawings.

3.09 Labeling:

- A. All fiber optic cables shall be identified by circuit numbers in all cabinets, pull boxes, wireways, and other enclosures and access locations and at all terminal points. Cable designations shall be as shown on the Contractor's approved shop drawings. The tag ties shall be wrapped around all cables comprising the circuit to be identified.
- B. Cable tags shall be suitable for wet locations and shall be stainless steel tags, No. 28 gauge and 7.5 inches wide, embossed with letters and numbers approximately 3/8 inch high, fastened to the cable or wire with nylon cable ties.
- C. Tags shall indicate which subsystem and trunk or Drop Cable it is connected to and the cabinet number for the other end of the link as indicated in the Contract Drawings.
- D. The Contractor shall label the fiber connectors at the Patch Panel. The labeling scheme selected shall clearly identify the fiber number and connecting device. The labeling scheme is to be approved by the Engineer.

3.10 Testing Requirements:

- A. The following tests shall be conducted. All tests shall be conducted in accordance with approved test procedures. The Contractor shall submit test procedures and forms in paper and electronic formats for approval to the Engineer.
- B. As required in 3.03, the Contractor shall measure and record the splice quality of each fusion splice performed. This information shall be submitted to the Engineer as part of the final testing documentation.
- C. An OTDR shall be used for backscattered light measurements. The OTDR shall operate at a nominal wavelength of 1310 nm and 1550 nm and shall include all necessary hardware required to couple it with unconnectorized single mode fiber.
 - 1. Existing Fiber Cable Verification Test: Prior to splicing fibers installed under this contract to existing fibers (where designated in the plans), the Contractor shall verify and record the loss characteristics of the existing fiber. Any anomalies shall be reported to the Engineer. Testing the existing fiber and splicing to the existing fiber

shall be paid for under the work described in Section 4.7 (Miscellaneous Fiber Work) of this specification.

2. Pre-Installation Tests:

The fiber optic cable shall be inspected and tested at the site storage area prior to installation.

Proper fiber cladding and fiber tube colors shall be verified by visual inspection. Any difference discovered from approved fiber optic cable plant layout or approved catalog cut sheets for the cable shall be grounds for rejection of the cable.

Each optical fiber in the cable shall be tested from one end with an OTDR compatible with wavelength and fiber type. Testing shall check for continuity, length, anomalies, and approximate attenuation at both 1310 nm and 1550 nm wavelengths. Each measurement shall be recorded with color, location and type of fiber measure. In the event that a meaningful measurement cannot be made from one end, it shall be performed from the opposite end of that fiber.

If the measured attenuation does not meet or exceed the specified performance criteria of these specifications, the cable shall be rejected.

The Contractor shall assure that the specifications of the fiber optic cable are met prior to installation.

3. Proof of Performance Test:

After the fiber cable has been installed, but prior to any splicing, the Contractor shall conduct a proof of performance test.

The Contractor shall measure the attenuation of a minimum of 10% of the total fibers selected at random. The Contractor shall sequence the fibers which are to be measured after each pull, such that the same fibers are not measured on consecutive lengths.

The Contractor shall record the reel number from which the cable came, the identification of the fibers measured and the attenuation in dB/km of the fibers measured.

If the measured attenuation does not meet or exceed the specified performance criteria of these specifications, additional testing may be necessary or the cable shall be rejected.

4. Acceptance Testing: After each splice and connector installation, all optical fiber spans (including all dark/spare fibers and unconnectorized fibers) shall undergo the following tests after installation of all connectors and splices. A span is defined as a continuous length of fiber including all splices and connectors:

Using an OTDR test each span bi-directionally at 1310 nm and 1550 for fiber attenuation, continuity, length, and anomalies. Each optical fiber shall meet the following acceptance criteria:

Attenuation: Not to exceed 0.3 dB/km at 1550 nm and 0.4 dB/km at 1310 nm + 0.15 dB/splice + 0.5 dB/connector. The number of splices and cable attenuation shall be based upon the approved cable plant layout.

Anomalies: No event shall exceed 0.3 dB. If any event is detected at that value, the Contractor shall repair or replace that section of cable.

Using an optical source and a power meter, measure the attenuation from both ends. The measured attenuation shall meet the criteria defined for the attenuation using the OTDR.

All cable that fails to meet the aforementioned requirements shall be replaced.

The Contractor shall maintain a test result record of each span and each fiber. Optical fiber spans shall be identified in the test results by identifying the fiber under test and by identifying the field cabinet at which the OTDR and power meter was connected.

The test results shall include the following measurement:

Total length of the single mode link

Total attenuation of the single mode link

Attenuation of each splice in the link under test

Attenuation per kilometer of each interconnected fiber in the link under test.

Attenuation shall be measured in decibels referencing optical power.

Each single mode fiber and splice tested shall be tested to meet the performance requirements in accordance with the contract.

The Contractor shall submit to the Engineer a tabulated list of fibers and the actual end-to-end measured values from the above tests and all traces and loss length printouts and in electronic format (with .sor file extension). This test data shall be the basis of acceptance for the fiber.

For optical fibers spliced to existing fibers, this test shall be repeated between the control center and the field termination after the new and existing fibers have been spliced together. If a fiber fails to meet the loss characteristics for the spliced section fiber, the Contractor shall determine whether the excessive loss is the result of an anomaly in the new section of fiber, splice or existing section of fiber. The Contractor shall, however, be responsible for the new section of fiber and the splice between the two sections.

3.11 Close-out Documentation:

- A. Five (5) complete sets of operation and maintenance manuals shall be provided. As-built drawings are required to be completed in MicroStation (.dgn) format and shall include, but not be limited to the following items: the location of the fiber facilities as determined by off-sets from the edge of travel lanes (from yellow or white solid pavement stripe/markings) and depths

of the facilities at every delineator; whether the facilities are bored, trenched, or attached to bridge structures; culvert locations in close proximity to the facilities; all ducts, hand holes, fiber optic cables and associated facilities. The as-builts must show every mile and tenth of a mile delineator, the Thruway ROW fence, all cross streets, ramps, streams, rivers and railroads. The beginning and end points of bores, and all culvert and hand hole/manhole locations are to be shown measured along the edge of travel lanes (from yellow or white solid pavement stripe/markings and) from the nearest tenth of a mile marker to the South or East. All splice enclosures, man/hand holes shall be located by coordinates obtained from a hand held GPS unit with minimum accuracy of ± 1 foot. As-builts also need to be organized by milepost with a reference chart to locate the desired location. If so provided under other items (such as the innerduct item), the Contractor shall obtain the electronic plan drawings of the innerduct path for use in developing the fiber plans.

- B. The manuals shall, as a minimum, include the following:
1. Complete and accurate as-built plans showing the fiber optic cable plant, actual fiber distance readings (from the fiber cable jacket), and locations of all splice enclosures. Splice enclosures shall be located by coordinates (obtained from a hand held GPS unit with an accuracy of at least ± 15 feet) and shown on the as-built plans.
 2. Complete fiber assignment diagram. If available, the Contractor will be provided with an electronic copy of the existing fiber assignment diagrams that the Contractor shall use in the development of the as-built fiber assignment diagrams for this project.
 3. Complete performance data of the cable plant showing the complete fiber run, including losses at each splice joint and each terminal connector.
 4. Installation, splicing, terminating and testing procedures.
 5. Complete parts list including names of vendors.
 6. Complete maintenance and trouble-shooting procedures.

END OF SECTION 13591

ITEM 627.0014 25**CONVEYING SYSTEMS****1. DESCRIPTION:**

- 1.01 Furnish all labor, materials, equipment and services necessary to complete the work as indicated on the Contract Plans and the attached Specification Summary.
- 1.04 All work shall conform to the requirements specified in Part 1 – General, of the Sections listed.

2. MATERIALS:

- 2.01 The materials shall be as specified in Part 2 – Products, of the Sections listed.

3. CONSTRUCTION DETAILS:

- 3.01 The construction details shall be as specified on Part 3 – Execution, if the Sections listed.

4. METHOD OF MEASUREMENT:

- 4.01 This item shall be measured for payment on a lump sum basis for the work completed in accordance with the Contract Documents and as directed by the Engineer.

5. BASIS OF PAYMENT:

- 5.01 Payment for this item shall be made at the lump sum bid price bid. The lump sum price bid shall include cost of furnishing all labor, material, equipment and appliances necessary to complete the work as indicated on the Contract Plans and as specified herein in the Sections listed.
- 5.02 Detailed Estimate:
 - A. Before the first certificate of payment is issued for the work under this item, submit a detailed estimate of quantities and prices for all materials, labor, and other items included under this item, which shall aggregate the contract lump sum price bid for this item. Prepare the detailed estimate in the same sequence as the Sections listed.
 - B. The detailed estimate shall be supported by such evidence, including certified copies of subcontracts, as the Engineer may require.
 - C. The detailed estimate must be approved by the Engineer who may revise it as, in his/her reasonable judgment, is necessary to make the various item conform to their true values. The value of each certificate of payment will be based on the approved detailed estimate.
- 5.03 Monthly payments will be made for this item in proportion to the total amount of work completed.

ITEM 627.0014 25**CONVEYING SYSTEMS****1. SPECIFICATION SUMMARY**

1.01 This Item includes the following specifications:

A. Section 14223 Free Standing Jib Cranes

B. Section 14232 Electric Chain Hoists

1.02 This item shall include, but not be limited to, the following:

A. Conveying systems needed to hoist and move components of the pumphouse upgrade.

SECTION 14223 - FREE STANDING JIB CRANES

PART 1 - GENERAL

1.1 SCOPE

- A. This Section includes the furnishing of a free standing, electrically operated, jib crane with rotating boom assembly.

1.2 PERFORMANCE REQUIREMENTS

- B. Crane shall consist of free standing mast requiring only foundation support and a rotating boom.
 - 1. Rotation: Primary boom: 360 degrees.
 - 2. Crane shall be designed for minimum effort manual rotation.
 - 3. Boom shall not drift when at rest.
 - 4. Maximum deflection at boom end: 1/150 span based on capacity plus 15 percent for hoist and trolley weight.
- C. Crane shall be designed to withstand:
 - 1. Crane and hoist dead load.
 - 2. Live load capacity equal to net rated hook load: 6,000 pounds.
 - 3. Inertia forces from crane and load movement.
 - 4. Wind load: Refer to structural drawings.
 - 5. Thermal load: -20 to 115 degrees F temperature range.
 - 6. Snow live load: Refer to structural drawings.
 - 7. Seismic load for seismic zone: Refer to structural drawings.

1.3 SUBMITTALS

- A. Product data for crane and accessories. Describe capacities, performance, operation, and applied forces to foundation.
- B. Shop drawings showing crane configuration, dimensions, and construction and installation details.
- C. Copy of required warranty.

- D. Manufacturer's installation instructions.
- E. Manufacturer's operation and maintenance manual.

1.4 QUALITY ASSURANCE

- F. Manufacturer: Company specializing in designing and manufacturing cranes with 10 years successful experience.
- G. Installer: Company experienced in assembly and installation of cranes and acceptable to crane manufacturer.
- H. Crane shall be designed, fabricated, and installed in accordance with ANSI B30.11 and OSHA 1910-179.
- I. Base crane structural design on live load capacity plus 15 percent for hoist and trolley weight and 25 percent for impact.
- J. Perform welding by certified operators in accordance with AWS D14.1.
- K. Bolted connections shall be in accordance with torque tightening procedures specified in AISC Manual, Part 5.
- L. Clearly label crane with rated load capacity. Place label at height and location easily read from floor level and loading position.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURES

- A. Gorbel, Inc. Model No. FS300 or approved equal.

2.2 FREE STANDING JIB CRANE

- A. Type. Free standing, base plate mounted, motorized, steel jib crane with rotating boom, electrical entry collector, and other accessories.
- B. Span. 15 feet.
- C. Under boom height. 15 feet.
- D. Construction. Fabricate from ASTM A36 steel sections with finished ends and surfaces.
 - 1. Mast. Stationary steel pipe, perpendicular to boom. Equip mast top with plate and pivot pin to receive head assembly.
 - 2. Boom. Horizontal, wide flange steel beam bolted to head assembly and designed for hoist trolley traveling on bottom flange. Reinforce with cap channel as required for

lateral stability. Equip boom with stops to limit movement of trolley.

3. Head assembly. Welded steel plate and channel fabrication fitted over mast, bolted to boom, and designed to transfer boom load to mast and to rotate. Assembly shall allow for installation of head prior to boom attachment and provide maximum hoist lift.

Top pivot bearing assembly: Designed to connect head assembly to mast and transfer load from boom. Weight bearing channel connecting sides of head assembly shall contain tapered roller bearings allowing easy rotation.

Retaining pin: Inserted through mast pivot pin above weight bearing channel to prevent accidentally dislodging head assembly. Cranes without retaining pin are not acceptable.

Trunnion roller assembly: Designed to rotate around mast and transmit moment force from boom to mast. Provide trunnion rollers with tapered bearings held in steel channel with 1 inch diameter bolts. Masts less than 18 inches diameter shall have 2 rollers and larger masts shall have 4 rollers. Assembly shall rotate around mast with full roller face contact. Roller surface shall be sufficiently large to prevent cutting into mast. Cranes with small rollers or cams requiring wear band on mast are not acceptable.

- E. Base plate mounting. Provide hexagonal steel base plate welded to mast for anchoring crane to concrete foundation cast flush with floor slab.
 1. Gussets: Weld triangular, full-web gusset plates to mast and base plate for stability and reinforcement. Cranes with open gussets or base plates made from rings and subject to warping are not acceptable.
 2. Base plate to be installed on foundation with anchor bolts of number, size, and pattern as indicated on shop drawings.

2.3 MOTORIZED OPERATION

- A. Provide motor operator to rotate crane boom. Operator to be bolted to back side of head assembly.
- B. Type. Variable frequency, direct drive allowing single or multiple speed applications, with torque limiter and worm gear reducer in oil bath.
- C. Motor. 1 HP, 1800 RPM, 3 phase, Class B, 40 degrees C ambient continuous, C faced, 30 minutes rated. Motor shall be enclosed and fan cooled.
- D. Controls. Pre-wired controls in NEMA 4X enclosure with magnetic reversing starter, thermal overload protection, voltage transformer, and fuse block. Power supply to be 460 volt, 3 phase, 60 cycle.

2.4 ACCESSORIES

- A. Electrical bottom entry collector and festoon system. Provide electrical collector installed in weight bearing channel of head assembly to conduct electrical power from inside mast through mast pivot pin to motor operator on head assembly and electrically operated hoist and trolley on boom. Collector shall allow continuous 360 degrees crane rotation.

- B. Provide a tagline and festooned flat cable system to power the motorized hoist and trolley specified in Section 14232.

2.5 SHOP FINISHING

- A. Steam wash steel crane components with iron phosphate solution and apply yellow baked enamel finish.
- B. Provide spray can of matching color, air-drying paint for field touch-up.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate provision of crane with:
 1. Design and construction of reinforced concrete footings as detailed on Drawings and specified in other sections. Ensure that accurate crane applied forces and anchor bolt patterns are provided for foundation design.
 2. Provision of electrical supply, conduit, wiring, disconnect switch, and other electrical components for powering motorized crane and electrically operated hoist.
- B. Prior to installation:
 1. Verify reinforced concrete foundations have cured 7 days minimum. Ensure that foundations have cured 28 days minimum prior to using crane to full capacity.
 2. Verify type and location of power supply.
 3. Inventory parts. Verify all required components are available and undamaged.

3.2 INSTALLATION

- C. Install crane and accessories in accordance with manufacturer's instructions and shop drawings.
- D. Do not modify crane components in any manner without advance, written approval by crane manufacturer.
- E. Clearances for moving crane components:
 1. 3 inch minimum vertical clearance from any overhead obstruction.
 2. 2 inch minimum horizontal clearance from any lateral obstruction.
- F. Mast: Cover base plate foundation area with 1 inch grout. Set mast into place and completely seat base plate in grout. Use plumb bob with 60 inch minimum line to plumb mast. Check alignment at 60 degree points. When mast is plumb and grout cured, tighten anchor bolts to full

compression of lock washer.

- G. Head assembly: Install head assembly with electrical bottom entry collector on mast. Bolt motor operator to back side of head assembly. Make electrical connections. Adjust rollers for smooth, full contact rotation.
- H. Boom: Set boom on head assembly attach with bolts and other manufacturer provided hardware. Level boom with shims or adjusting hex nuts.
- I. End stops: In conjunction with hoist trolley installation, bolt end stops to boom ends.

3.3 FIELD QUALITY CONTROL

- J. Move boom through entire travel to ensure boom is clear of obstructions, rotates freely, and does not drift. Verify motorized operation, controls, and limit switches function properly.
- K. Inspect installed crane. Verify all bolts are tight and lock washers fully compressed. Verify mast is plumb and boom is level.
- L. Field test crane and accessories for operating functions. Ensure crane movement is smooth and proper. Adjust as required and correct deficiencies.
- M. Clean surfaces. If necessary, touch-up paint damage, scratches, and blemishes with manufacturer provided matching paint.
- N. Protect cranes from other construction operations.
- O. Installation Check. An experienced, competent, and authorized representative of the manufacturer shall visit the site of the Work and inspect, check, adjust if necessary, and approve the equipment installation. The representative shall be present when the equipment is placed in operation in accordance with Division 1, and shall revisit the job site as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of Owner's Representative.
- P. The manufacturer's representative shall furnish a written report certifying that the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily.
- Q. Installation Supervision. The equipment manufacturer shall furnish a qualified installation supervisor during the equipment installation. All costs of these services shall be included in the contract price. The manufacturer's installation supervisor shall observe, instruct, guide and direct the contractor's installation process.

END OF SECTION 14223

SECTION 14232 - ELECTRIC CHAIN HOISTS

PART 1 - GENERAL

1.1 SCOPE

- A. Section includes furnishing electrically powered, pendant operated chain hoists to be mounted on trolleys to lift and move loads. Trolleys to move chain hoists are also included.
- B. Related sections:
 - 1. Section 14223 - Free -Standing Jib Crane: Crane system where electric chain hoist is installed.
 - 2. Division 16 - Electrical: Electrical supply, conduit, wiring, disconnect switch, grounding, and other electrical components for powering chain hoist.

1.2 PERFORMANCE REQUIREMENTS

- A. Electric chain hoists shall be designed, fabricated and installed to comply with applicable requirements of ASME, FEM/ISO, NFPA 70 and OSHA.
- B. Electric chain hoists shall lift and lower loads in response to operator's use of pendant controller.
- C. Capacity overload: Hoist shall not lift load that exceeds rated capacity. Hoists are shipped with the clutch set for 10% higher than the rated capacity in kilograms.
- D. Power loss protection: Braking system shall lock hoist in place in event of power loss.

1.3 SUBMITTTALS

- A. Product data for electric chain hoists and trolleys. Describe materials, capacities, performance, and operation.
- B. Shop drawings showing construction, dimensions, connections, and fabrication and installation details.
- C. Design loads: Calculations of loads transmitted from hoists to supporting structures.
- D. Copy of required warranty.
- E. Manufacturer's installation, operation, and maintenance instructions.

1.4 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in designing and manufacturing chain hoists, cranes, and other lifting and moving devices.
- B. Clearly label chain hoist with rated load capacity. Place label at location easily read from floor level and operating position.

1.5 WARRANTY

- A. 2-year warranty for electric chain hoist to cover defects in materials and workmanship.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURES

- A. Gorbel, Inc. Model GECH-2-D-32/8-RH-460-50-1-P or approved equal.

2.2 ELECTRIC CHAIN HOISTS

- A. Type: Electrically powered, pendant operated chain hoist to be attached to trolleys on cranes and other material handling equipment to lift and move loads.
- B. Operational functions:
 - 1. Design and fabricate chain hoist to lift specified load and perform functions described in Part 1 above.
 - 2. Lifting capacity: 3 tons.
 - 3. Number of falls: 1.
 - 4. Lift speed: Dual speed model: 8 and 38 feet per minute.
 - 5. Duty rating in accordance with ASME HST: H3.
 - 6. Voltage: 460 Vac.
 - 7. Motor horsepower: 5 HP.
 - 8. Lift dimension: 50 feet.
 - 9. Headroom dimension: 26.69 inches.
- C. Construction: Chain hoist shall be housed in an aluminum, compact housing and include these features:
 - 1. Low voltage, 24VAC control circuit for operator protection.

2. Modular DC brake and clutch is easily accessible for routine inspection and/or service.
3. Totally enclosed, fan cooled motor.
4. Case hardened gears and other components.
5. Mainline contactor controlled by e-stop on the pendant control handle.

D. Hoist control.

1. Pendant Control. Provide pendant type control device to functionally operate chain hoist as indicated on reviewed shop drawings.

Type: Pendant type control handle equipped with: UP, DOWN switch and Emergency Stop to operate hoist. Pendant cable with wire rope strain relief.

Limit switches: Equip chain hoist system with modular upper and lower limit switches.

E. Accessories:

1. Chain container: Manufacturer's standard plastic bucket type.
2. Suspension plates: Rigid hook

2.3 TROLLEYS

A. Provide trolleys for electric chain hoists.

B. Type: Motor driven, two speed.

1. Flange width: Coordinate with Specification Section 14223.
2. Speed: 19 and 78 feet per minute.
3. Capacity: 3 tons.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate provision of electric chain hoists and trolleys with:

1. Section 14223 - Free -Standing Jib Crane. New crane system where electric chain hoists are installed.
2. Division 16 - Electrical: Electrical supply, conduit, wiring, disconnect switch, grounding, and other electrical components for powering chain hoists.

3. Ensure crane systems are compatible with chain hoist.
4. Verify that capacity of the hoist matches or is less than capacity of the system on which hoist will be installed.

3.2 INSTALLATION

- A. Install chain hoists in accordance with manufacturer's instructions and reviewed shop drawings.
- B. Do not modify components in any manner without advance, written approval from system manufacturer.
- C. Field quality control: After installation, move chain hoist through entire travel to ensure system is clear of obstructions and hoist moves freely and smoothly.
- D. Field test system with simulated loads attached to chain hoist. Test all control pendant handle functions. Ensure system operates functionally, safely, and smoothly. Adjust as required and correct deficiencies.
- E. Clean surfaces.

3.3 FIELD QUALITY CONTROL

- A. Installation Check. An experienced, competent, and authorized representative of the manufacturer shall visit the site of the Work and inspect, check, adjust if necessary, and approve the equipment installation. The representative shall be present when the equipment is placed in operation in accordance with Division 1, and shall revisit the job site as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of Owner's Representative.
- B. The manufacturer's representative shall furnish a written report certifying that the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily.
- C. Installation Supervision. The equipment manufacturer shall furnish a qualified installation supervisor during the equipment installation. All costs of these services shall be included in the contract price. The manufacturer's installation supervisor shall observe, instruct, guide and direct the contractor's installation process.

END OF SECTION 14232

NEW YORK STATE THRUWAY AUTHORITY
NIAGARA PUMP HOUSE UPGRADE

C&S #185.026.004

ITEM 627.0015 25

MECHANICAL

1. DESCRIPTION:

- 1.01 Furnish all labor, materials, equipment and services necessary to complete the work as indicated on the Contract Plans and the attached Specification Summary.
- 1.02 All work shall conform to the requirements specified in Part 1 – General, of the Sections listed.

2. MATERIALS:

- 2.01 The materials shall be as specified in Part 2 – Products, of the Sections listed.

3. CONSTRUCTION DETAILS:

- 3.01 The construction details shall be as specified on Part 3 – Execution, if the Sections listed.

4. METHOD OF MEASUREMENT:

- 4.01 This item shall be measured for payment on a lump sum basis for the work completed in accordance with the Contract Documents and as directed by the Engineer.

5. BASIS OF PAYMENT:

- 5.01 Payment for this item shall be made at the lump sum bid price bid. The lump sum price bid shall include cost of furnishing all labor, material, equipment and appliances necessary to complete the work as indicated on the Contract Plans and as specified herein in the Sections listed.
- 5.02 Detailed Estimate:
 - A. Before the first certificate of payment is issued for the work under this item, submit a detailed estimate of quantities and prices for all materials, labor, and other items included under this item, which shall aggregate the contract lump sum price bid for this item. Prepare the detailed estimate in the same sequence as the Sections listed.
 - B. The detailed estimate shall be supported by such evidence, including certified copies of subcontracts, as the Engineer may require.
 - C. The detailed estimate must be approved by the Engineer who may revise it as, in his/her reasonable judgment, is necessary to make the various item conform to their true values. The value of each certificate of payment will be based on the approved detailed estimate.
- 5.03 Monthly payments will be made for this item in proportion to the total amount of work completed.

ITEM 627.0015 25**MECHANICAL****1. SPECIFICATION SUMMARY**

1.01 This Item includes the following specifications:

- A. Section 15010 Valve Installation
- B. Section 15020 Miscellaneous Piping and Accessories Installation
- C. Section 15061 Ductile Iron Pipe
- D. Section 15069 Cast Iron Soil Pipe and Accessories
- E. Section 15070 Copper Tubing and Accessories
- F. Section 15091 Miscellaneous Ball Valves
- G. Section 15093 Check Valves
- H. Section 15102 Eccentric Plug Valves
- I. Section 15108 Air Release and Combination Air Valves
- J. Section 15140 Pipe Supports
- K. Section 15180 Valve Actuators
- L. Section 15250 Mechanical Insulation
- M. Section 15400 Plumbing
- N. Section 15500 Heating, Ventilating, and Air Conditioning

1.02 This item shall include, but not be limited to, the following:

- A. Components and installation regarding the pumphouse mechanical systems.

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SECTION 15010 - VALVE INSTALLATION

PART 1 - GENERAL

1.1 SCOPE

- A. This section covers the installation of new valves and actuators purchased by CONTRACTOR as part of this Work. Cleaning, pressure and leakage testing, insulation, and pipe supports are covered in other sections. The following specification sections are applicable to valves to be installed:
 - 1. Section 15093 – Check Valves
 - 1. Section 15102 - Eccentric Plug Valves
 - 2. Section 15108 - Air Release/Combination Air Valves

1.2 GENERAL

- A. Equipment installed under this section shall be erected and placed in proper operating condition in full conformity with drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by OWNER'S REPRESENTATIVE.
- B. Coordination. When manufacturer's field services or installation check services are provided by the valve manufacturer, CONTRACTOR shall coordinate the services with the valve manufacturer. CONTRACTOR shall give OWNER'S REPRESENTATIVE written notice at least 30 days prior to the need for manufacturer's field services. CONTRACTOR shall review equipment submittals and coordinate with the requirements of the Work and the Contract Documents. CONTRACTOR accepts sole responsibility for determining and verifying all quantities, dimensions, and field construction criteria. Flanged connections to valves including the bolts, nuts, and gaskets are covered in the appropriate pipe specification section.

1.3 DELIVERY, STORAGE, AND HANDLING.

- A. All equipment and materials shall immediately be delivered, stored and handled by CONTRACTOR in accordance with Specification Section 01612 and the manufacturer's instructions.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

3.1 INSPECTION

- A. All valves and accessories shall be inspected for damage and cleanliness before being installed. Any material damaged or contaminated in handling on the job shall not be used unless it is repaired and re-cleaned to the original requirements by CONTRACTOR. Such material shall be segregated from the clean material and shall be inspected and approved by OWNER'S REPRESENTATIVE.

3.2 INSTALLATION

- A. General: Valves shall be installed with sufficient clearance for proper operation of any external mechanisms, and with sufficient clearance to dismantle the valve for in place maintenance. Installation shall be in accordance with the valve manufacturer's recommendations. Unless otherwise indicated on the drawings, all valves installed in horizontal runs of pipe having centerline elevations 4 feet 6 inches or less above the finish floor shall be installed with their operating stems vertical. Valves installed in horizontal runs of piping having centerline elevations between 4 feet 6 inches and 6 feet 9 inches above the finish floor shall be installed with their operating stems horizontal. If adjacent piping prohibits this, the stems and operating hand wheel shall be installed above the valve horizontal centerline as close to horizontal as possible. Valves installed in vertical runs of pipe shall have their operating stems oriented to facilitate the most practicable operation, as reviewed by OWNER'S REPRESENTATIVE.
- B. Installation Checks: When specified in the valve sections, installation checks will be provided by a manufacturer's representative.
- C. Check Valves
 - 1. Lift Check Valves: Horizontal lift checks shall be installed in a level horizontal position so that the internal parts rise and fall vertically, unless the valve is spring loaded. Angle pattern lift checks shall be installed in vertical pipe with flow upward from beneath the disc.
 - 2. Swing Check Valves: Install valves oriented for the correct flow direction. Only valves designed for vertical installation shall be installed in vertical piping.
- D. Eccentric Plug Valves: Eccentric plug valves shall be installed with the shaft horizontal and the plug in the upper half of the valve body. Valves in wastewater, sludge, or scum lines shall be installed with the seat on the upstream end.
- E. Air Release and Combination Air Valves: The exhaust from each valve shall be piped to a suitable point acceptable to OWNER'S REPRESENTATIVE. Air release valve exhaust piping leading to a trapped floor drain shall terminate at least 6 inches above the floor.

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3.3 VALVE ACTUATORS

- A. Valve actuators and accessories shall be installed in accordance with the equipment manufacturer's recommendations.

3.4 FIELD QUALITY CONTROL.

- A. Field Testing: After installation, all valves shall be tested in conjunction with the pipeline pressure and leakage testing section.
 - 1. Pressure Tests: Pressure testing shall be in accordance with the pipeline pressure and leakage testing section.
 - 2. Leakage Tests: All valves shall be free from leaks. Each leak that is discovered within the correction period stipulated in the General Conditions shall be repaired by and at the expense of CONTRACTOR. This requirement applies whether pressure testing is required or not.

END OF SECTION 15010

SECTION 15020 - MISCELLANEOUS PIPING AND ACCESSORIES INSTALLATION

PART 1 - GENERAL

1.1 SCOPE

- A. This section covers the installation of piping and accessories as indicated on the Drawings and as indicated in the Piping Schedule for the following piping sections:

1. Section 15067 - Miscellaneous Plastic Pipe, Tubing, and Accessories
2. Section 15069 - Cast Iron Soil Pipe and Accessories
3. Section 15070 - Copper Tubing and Accessories

CONTRACTOR shall furnish all necessary jointing materials, coatings, and accessories that are specified herein. Pipe supports and anchors shall be furnished by CONTRACTOR, and are covered in the Pipe Supports Section 15140.

1.2 GENERAL

- A. Coordination. Materials installed under this section shall be installed in full conformity with drawings, specifications, engineering data, instructions, and recommendations of the manufacturer, unless exceptions are noted by OWNER'S REPRESENTATIVE.

1.3 SUBMITTAL

- A. Drawings and Data. Complete specifications, data, and catalog cuts or drawings shall be submitted in accordance with the Submittals section. Items requiring submittals shall include, but not be limited to, the following:

Watertight/dust tight pipe sleeves.

Materials as specified herein.

1.4 QUALITY ASSURANCE

- A. Welding and Brazing Qualifications. All welding and brazing procedures and operators shall be qualified by an independent testing laboratory in accordance with the applicable provisions of Section IX of the ASME Code. All procedure and operator qualifications shall be in written form and subject to OWNER'S REPRESENTATIVE'S review. Accurate records of operator and procedure qualifications shall be maintained by CONTRACTOR and made available to OWNER'S REPRESENTATIVE upon request.
- B. Tolerances. These tolerances apply to in-line items and connections for other lines. The general dimension, such as face-to-face, face or end-to-end, face- or end-to center, and center-to-center shall be 1/8 inch. The inclination of flange face from true in any direction shall not exceed 3/64 inch per foot. Rotation of flange bolt holes shall not exceed 1/16 inch.

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1.5 DELIVERY, STORAGE, AND HANDLING

- A. Shipping, storage and handling shall be in accordance with Specification Section 01612. All materials shall be stored in a sheltered location above the ground, separated by type, and shall be supported to prevent sagging or bending. Plastic pipe, tubing, and fittings shall be stored between 40°F and 90°F.
- B. Coated Pipe. Handling methods and equipment used shall prevent damage to the protective coating and shall include the use of end hooks, padded calipers, and nylon or similar fabric slings with spreader bars. Bare cables, chains, or metal bars shall not be used. Coated pipe shall be stored off the ground on wide, padded skids. Plastic-coated pipe shall be covered or otherwise protected from exposure to sunlight.

PART 2 - PRODUCTS

2.1 SERVICE CONDITIONS

- A. Pipe, tubing, and fittings covered herein shall be installed in the services indicated in the various pipe sections.

2.2 MATERIALS

Threaded Fittings	
Anti-Seize Thread Lubricant	Jet-Lube "Nikal", John Crane "Thred Gard Nickel", Never-Seez "Pure Nickel Special", or Permatex "Nickel Anti-Seize".
Teflon Thread Sealer	Paste type; Hercules "Real-tuff", John Crane "JC-30", or Permatex "Thread Sealant with Teflon".
Teflon Thread Tape	Hercules "Tape Dope" or John Crane "Thread-Tape".
Solvent Welded Fittings	
Solvent cement for PVC Systems	ASTM D2564.
Solvent cement for CPVC Systems	ASTM F493.
Sodium Hypochlorite, Sodium Hydroxide, and Sodium Bisulfite Service	IPS Corporation "Weld-On 724"
Primer for PVC Systems	ASTM F656.
Solder or Brazed Fittings	
Solder	Solid wire, ASTM B32, ANSI/NSF 61 certified, Alloy Grade Sb5, (95-5).
Soldering Flux	Paste type, ASTM B813.
Brazing Filler Metal	AWS A5.8, BCuP-5; Engelhard "Silvaloy 15", Goldsmith "GB-15", or Handy & Harman "Sil-Fos".
Brazing Flux	Paste type, Fed Spec O-F-499, Type B.
Insulating Fittings	

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Threaded	Dielectric steel pipe nipple, ASTM A53, Schedule 40, polypropylene lined, zinc plated; Perfection Corp. "Clearflow Fittings".
Flanged	Epco "Dielectric Flange Unions" or Central Plastics "Insulating Flange Unions".
Pipe Insulation	As per Mechanical Insulation Section 15250.
Watertight/Dusttight Pipe Sleeves	O-Z Electrical Manufacturing "Thruwall" and "Floor Seals", or Thunderline "Link-Seals"; with modular rubber sealing elements, nonmetallic pressure plates, and galvanized bolts.
Pipe Sleeve Sealant	Polysulfide or urethane, as specified in the Caulking section or as indicated on the drawings.
Locating (Tracing) Wire	10-gauge single strand solid core copper wire with nonmetallic insulation. Insulation color coded for the type of pipe being installed.
Detection Tape	Plastic and foil laminate, 3-inches wide, color coded and labeled as indicated in the specification. Labeling shall repeat every 20-36 inches.
Protective Coatings	As per Specification Section 09940.

PART 3 - EXECUTION

3.1 INSPECTION

- A. All piping components shall be inspected for damage and cleanliness before being installed. Any material damaged or contaminated in handling on the job shall not be used unless it is repaired and re-cleaned to the original requirements by CONTRACTOR. Such material shall be segregated from the clean material and shall be inspected and approved by Owner or his representative before its use.

3.2 PREPARATION

- A. Field Measurement. Pipe shall be cut to measurements taken at the site, not from the drawings. All necessary provisions shall be made in laying out piping to allow for expansion and contraction. Piping shall not obstruct openings or passageways. Pipes shall be held free of contact with building construction to avoid transmission of noise resulting from expansion.

3.3 INSTALLATION

- A. General. All instruments and specialty items shall be installed according to the manufacturer's instructions and with sufficient clearance and access for ease of operation and maintenance.
- B. Pipe Sleeves. Piping passing through concrete or masonry shall be installed through sleeves that have been installed before the concrete is placed or when masonry is laid. Pipe sleeves installed through floors with a special finish, such as ceramic or vinyl composition tile, shall be flush with the finished floor surface and shall be provided with nickel or chromium plated floor plates. Unless otherwise indicated on the Drawings, in all other locations where pipes pass through

floors, pipe sleeves shall project not less than 1 inch nor more than 2 inches above the floor surface, with the projections uniform within each area. In the case of insulated pipes, the insulation shall extend through pipe sleeves. Where the drawings indicate future installation of pipe, sleeves fitted with suitable plastic caps or plugs shall be provided. Holes drilled with a suitable rotary drill will be considered instead of sleeves for piping which passes through existing concrete and masonry interior walls and through floors with a special finish. Unless otherwise indicated on the drawings, all pipes passing through walls or slabs that have one side in contact with earth or exposed to the weather shall be sealed watertight with special rubber-gasketed sleeve and joint assemblies, or with sleeves and modular rubber sealing elements. Piping passing through locations as required shall be made dust-tight and gastight with special rubber-gasketed sleeve and joint assemblies; with sleeves sealed with modular rubber sealing elements; or by caulking with oakum and polysulfide or urethane sealant.

- C. Pipe Joints. Pipe joints shall be carefully and neatly made in accordance with the indicated requirements. Threaded joints in plastic piping shall be made up with Teflon thread tape applied to all male threads. Threaded joints in stainless steel piping shall be made up with Teflon thread sealer and Teflon thread tape applied to all male threads. Threaded joints in steel piping for chlorine service shall be made up with Teflon thread tape or litharge and glycerin paste applied to all male threads.
1. Threaded. Pipe threads shall conform to ANSI/ASME B1.20.1, NPT, and shall be fully and cleanly cut with sharp dies. Not more than three threads at each pipe connection shall remain exposed after installation. Ends of pipe shall be reamed after threading and before assembly to remove all burrs. Unless otherwise indicated, threaded joints shall be made up with Teflon thread tape, thread sealer, or a suitable joint compound.
 2. Solvent Welded. Solvent welded connections shall only be used for PVC or CPVC pipe. All joint preparation, cutting, and jointing procedures shall comply with the pipe manufacturer's recommendations and ASTM D2855. Pipe ends shall be beveled or chamfered to the dimensions recommended by the manufacturer. Newly assembled joints shall be suitably blocked or restrained to prevent movement during the setting time recommended by the manufacturer. Pressure testing of solvent welded piping systems shall not be performed until the applicable curing time, as set forth in Table X2.1 of ASTM D2855, has elapsed. Solvent welding shall be performed by bonding operators who have met the requirements of ASME B31.3 and A328.
 3. Flanged. Flange bolts shall be tightened sufficiently to slightly compress the gasket and affect a seal, but shall not be torqued less than the minimum value required by the gasket manufacturer. Flange bolts shall not be so tight as to fracture or distort the flanges. A plain washer shall be installed under the head and nut of bolts connecting plastic pipe flanges. Anti-seize thread lubricant shall be applied to the threaded portion of all stainless steel bolts during assembly.

Flange bolt holes shall be oriented as follows, unless otherwise indicated on the spool drawings:

Vertical flange face: Bolt holes to straddle the vertical centerlines.

Horizontal flange face: Bolt holes to straddle plant north-south centerlines.

Pipe sealants, thread compounds, or other coatings shall not be applied to flange gaskets unless recommended by the gasket manufacturer for the specified service and approved by OWNER'S REPRESENTATIVE. Welds at orifice flanges shall have internal surfaces ground smooth to the pipe wall. Slip-on flanges shall be welded inside and outside. There shall be a distance of approximately 1/16 to 1/8 inch between the edge of the fillet weld and the face of the flange. The seal weld shall be applied so that the flange face shall be free of weld spatter and does not require refacing. Flat-faced flanges shall be used when mating to Class 125 flanges. Full-face gaskets shall be used with flat-faced flanges and ring gaskets shall be used with raised faced flanges. Weld neck flanges shall be used with butt-weld fittings. The bore of weld neck flanges shall match the pipe wall thickness. Insulating joints connecting submerged (buried) piping to exposed piping shall be installed above the maximum water surface elevation and before the first pipe support not having coated anchor bolts or adhesive-bonded concrete anchors. All submerged (buried) metallic piping shall be isolated from the concrete reinforcement. Insulating flanges shall be tested for electrical isolation after installation and bolt-up but prior to introduction of conducting fluid.

4. Welded. Welding shall conform to the specifications and recommendations contained in the "Code for Pressure Piping", ANSI B31.1. Weld cross-sections shall be equal to or greater than the pipe wall thickness. Welds shall be smooth and continuous and shall have interior projections no greater than 1/16 inch. Backing strips or rings shall not be used except with specific prior review by OWNER'S REPRESENTATIVE as to use, material, and design. Root gap inserts that are completely melted and consumed in the weld bead are acceptable only when reviewed in advance by OWNER'S REPRESENTATIVE. Stainless steel welding shall be inert gas tungsten arc (TIG) or the direct current, straight polarity, inert gas metal arc process (MIG). Carbon steel welding shall be made by the shielded metal arc process.
5. Grooved Couplings. Grooves for grooved couplings shall be cut with a specially designed grooving tool. Grooves cut in steel pipe shall conform to flexible grooving dimensions, as set forth in AWWA C606, and shall be clean and sharp without burrs or check marks.
6. Push-on. Gasket installation and other jointing procedures shall be in accordance with the recommendations of the manufacturer. Each spigot end shall be suitably beveled to facilitate assembly. All joint surfaces shall be lubricated with a heavy vegetable soap solution immediately before the joint is completed. Lubricant shall be suitable for use in potable water, shall be stored in closed containers, and shall be kept clean.
7. Epoxy and Adhesive Bonded. Epoxy and adhesive bonded joints shall only be used for FRP pipe. All joint preparation, cutting, and jointing procedures shall comply with the pipe manufacturer's recommendations. Adhesive shall be mixed and applied in accordance with the manufacturer's recommendations. After joining, either the pipe or the fitting shall be rotated approximately one-half turn to uniformly distribute adhesive. A slight fillet of adhesive at the bond line is desirable, but all excess adhesive shall be wiped off immediately. Newly assembled joints shall be suitably blocked or restrained to prevent movement during the curing period recommended by the manufacturer.
8. Heat Fusion Bonded. Heat fusion bonded joints shall be used for polyethylene pipe with socket and butt fusion fittings. All joint preparation, cutting, jointing equipment,

and jointing procedures shall comply with the pipe manufacturer's recommendations. The heating time, temperature, pressure applied to the joint during bonding, and cooling time shall consistently produce leaktight joints as strong as the pipe being joined.

9. Rubber-Gasketed. Rubber-gasketed joints for hub and spigot type cast iron soil pipe shall have plain spigot ends, without beads. Cut ends of all pipe shall be cut square, beveled, and all burrs shall be removed. Spigot ends shall be coated with a lubricant recommended by the gasket manufacturer and fully seated in the gasket. Clamps for hubless cast iron soil pipe shall be installed in accordance with the manufacturer's recommendations.
10. Compression. Ends of tubing shall be cut square and all burrs shall be removed. The tubing end shall be fully inserted into the compression fitting and the nut shall be tightened not less than 1-1/4 turns and not more than 1-1/2 turns past fingertight, or as recommended by the fitting manufacturer, to produce a leaktight, torque-free connection.
11. Flared. Ends of annealed copper tubing shall be cut square, and all burrs shall be removed prior to flaring. Ends shall be uniformly flared without scratches or grooves. Fittings shall be tightened as needed to produce leaktight connections.
12. Soldered and Brazed. Where solder fittings are specified for lines smaller than 2 inches, joints may be soldered or brazed at the option of Contractor. Joints in 2 inch and larger copper tubing shall be brazed. Brazing alloy shall contain no tin. Joints in copper chlorine tubing and refrigerant piping shall be brazed; solder will not be acceptable.

Surfaces to be joined shall be thoroughly cleaned with flint paper and coated with a thin film of flux.

Care shall be taken to avoid overheating the metal or flux. Each joint shall be uniformly heated to the extent that filler metal will melt on contact. While the joint is still hot, surplus filler metal and flux shall be removed with a rag or brush.

- D. Pipe. Pipe shall be installed as specified, as indicated on the drawings, or, in the absence of detail piping arrangement, in a manner acceptable to OWNER'S REPRESENTATIVE. Piping shall be installed without springing or forcing the pipe in a manner that would induce stresses in the pipe, valves, or connecting equipment. Piping shall be supported in conformance with the Pipe Supports Specification Section 15140.

1. Piping shall be connected to equipment by flanges or unions as specified in the various piping sections. Piping connecting to equipment shall be supported by a pipe support and not by the equipment.
2. Water, gas, and air supply piping shall be provided with a shutoff valve and union at each fixture or unit of equipment, whether or not indicated on the drawings, to permit isolation and disconnection of each item without disturbing the remainder of the system. Air supply piping shall be provided with sectionalizing valves and valved air inlet connections as needed for isolation of portions of the system for periodic testing.

3. A union shall be provided within 2 feet of each threaded-end valve unless there are other connections that will permit easy removal of the valve. Unions shall also be provided in piping adjacent to devices or equipment that may require removal in the future and where required by the drawings or the specifications.
4. All air piping shall be graded to points of drainage collection where drip legs and drain valves shall be provided. Air piping shall be sized for the service conditions, with the indicated minimum sizes:

Service Minimum Size

Air signal 1/4 inch OD

Air supply 1/2 inch OD

Bubbler drop pipes 3/4 inch

Buried piping 3/4 inch
5. Water supply piping within structures shall be arranged, and facilities provided, for complete drainage. All piping serving metering equipment shall be uniformly graded so that air traps are eliminated and complete venting is provided.
6. Stuffing box leakage from water sealed pumps shall be piped to the nearest point of drainage collection.
7. Taps for pressure gauge connections on the suction and discharge of pumping units shall be provided with a nipple and a ball type shutoff valve.
8. Drilling and tapping of pipe walls for installation of pressure gauges or switches will not be permitted.
9. In all piping, insulating fittings shall be provided to prevent contact of dissimilar metals, including but not limited to, contact of copper, brass, or bronze pipe, tubing, fittings, valves, or appurtenances, or stainless steel pipe, tubing, fittings, valves, or appurtenances with iron or steel pipe, fittings, valves, or appurtenances. Insulating fittings shall also be provided to prevent contact of copper, brass, or bronze pipe, tubing, fittings, valves or appurtenances with stainless steel pipe, tubing, fittings, valves, or appurtenances.
10. Branch connections in horizontal runs of steam, air, and gas piping shall be made from the top of the pipe.
11. Buried PVC piping shall be "snaked" in the trench and shall be kept as cool as possible during installation. PVC pipe shall be kept shaded and shall be covered with backfill immediately after installation.
12. All chemical piping shall be installed so that lines are readily accessible for cleaning. Tees shall be provided at regular intervals in all chemical piping except chlorine piping, with extra openings plugged, to facilitate cleaning. Teflon thread tape or teflon thread sealer shall be applied to the threads of the plugs so that they can be easily

removed. At each point where hose or reinforced plastic tubing is connected to rigid piping, a quick-disconnect coupling shall be provided.

13. Double-contained chemical feed piping shall be installed according to the manufacturer's recommendations. Joints shall be solvent cemented. Splitting and rewelding of fittings will not be acceptable. Suitable drains and vents shall be provided to permit complete drainage of both the primary and secondary containment piping. Interstitial supporting devices shall be designed to allow continuous drainage in the annular space to the drain ports. Drain fittings shall be designed to allow a valve attachment to be made so that the secondary containment compartment can be readily drained and manually inspected for leaks.
 14. Polyethylene piping shall be installed in accordance with the manufacturer's recommendations. A continuous 10 AWG THHN insulated copper tracer wire shall be placed 6 inches above all portions of the buried pipe, but no more than 18 inches below the ground surface. Where the pipe extends above grade, a 2 foot length of wire shall be coiled and attached to the pipe.
 15. Piping adjacent to flow sensors shall be installed in accordance with the requirements of the manufacturer of the flow sensor and commonly accepted design practices of the appropriate straight pipe runs both upstream and downstream.
 16. Drains required for operation are shown on the drawings. However, vents at all high points and drains at all low points in the piping that are required for complete draining for pressure test may not be shown on these drawings. Contractor shall add such items as found to be necessary during detail piping design and/or piping installation.
- E. Reducers. Eccentric reducers shall be installed flat on the top.
- F. Valves. Isolation valves provided with equipment and instruments shall be located in a manner that will allow ease of access and removal of the items to be isolated. Prior to soldering or brazing valves, Teflon and elastomer seats and seals shall be removed to prevent damage.
- G. Locating (Tracing) Wire. Locating wire, for electronically locating pipe after it is buried, shall be attached along the length of and installed with the pipe. This is applicable to all sizes and types of pressure mains. The tracing wire is to be attached to the pipe with nylon wire ties, as shown on the drawings. The wire itself shall be 10-gauge single strand solid core copper wire with non-metallic insulation. The insulation shall be color coded for the type of pipe being installed. Continuity must be maintained in the wire along the entire length of the pipe run.
- Permanent splices must be made in the length of the wire using wire connectors approved for underground applications as listed in the uniform electric code handbook. The wire shall extend to the surface and be connected to a test station box at valve locations in the manner, as shown on the drawings.
- H. Detection Tape. Detection tape shall be installed with all pipe. Detection tape for potable water piping shall be blue in color and shall be labeled "CAUTION, BURIED WATER MAIN". Detection tape for wastewater piping shall be green in color and shall be labeled "CAUTION, BURIED FORCE MAIN". Detection tape for non-potable water shall be black in color and shall be labeled "CAUTION, BURIED SERVICE WATER MAIN".

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3.4 PIPING ASSEMBLY

- A. General: CONTRACTOR shall only use labor that has been qualified by training and experience to capably perform the specified activities required to accomplish the work in a satisfactory manner
1. If there is a conflict between the mechanical drawings and piping and instrumentation drawings (P&IDs), the more stringent layout, as decided by the Owner's Representative shall take precedence. Any deviations from the Specifications or piping locations shown on the Drawings require prior review and approval by OWNER'S REPRESENTATIVE.

3.5 PROTECTIVE COATING

- A. Coating shall be as specified in Specification Section 01630 – Process Piping Schedule.

3.6 PRESSURE AND LEAKAGE TESTING

- A. All specified tests shall be made by the CONTRACTOR in the presence, and to the satisfaction of OWNER'S REPRESENTATIVE. The Contractor shall coordinate this section with the Pipeline Pressure and Leakage Testing Section 02704. Each piping system shall be tested for at least 2 hours. Piping shall be tested at the indicated pressures:

Test Type Designation	Service	Test Pressure	Medium
Test Type A	Potable Water	1.5 times working pressure but not less than 120 psi.	Water
Test Type C	Other Piping	1.5 times working pressure but not less than 50 psi.	Suitable fluid or gas.
Test Type D	Building Sanitary Sewer, Roof Drains, Vents	See Note #1	Water or Air (See Note #1)

Note #1 - Building sanitary sewer, roof drains and venting systems shall be water or air tested. For water testing, the piping system shall be filled with water to the level of the highest vent stack. For air testing, the piping system shall be charged with air to a pressure of 5 psig. Openings shall be plugged as necessary for either type of test. To be considered free of leaks, the system shall hold the water or air for 30 minutes without any drop in the water level or air pressure.

Compressed air or pressurized gas shall not be used for testing plastic piping unless specifically recommended by the pipe manufacturer.

Leakage may be determined by loss-of-pressure, soap solution, chemical indicator, or other positive and accurate method acceptable to OWNER'S REPRESENTATIVE. All fixtures, devices, or accessories which are to be connected to the lines and which would be damaged if subjected to the specified test pressure shall be disconnected and the ends of the branch lines plugged or capped as needed during the testing.

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All necessary testing equipment and materials, including tools, appliances and devices, shall be furnished and all tests shall be made by and at the expense of CONTRACTOR and at the time directed by OWNER'S REPRESENTATIVE.

All joints in piping shall be tight and free of leaks. All joints that are found to leak, by observation or during any specified test, shall be repaired, and the tests repeated.

3.7 CLEANING

- A. The interior of all pipe, valves, and fittings shall be smooth, clean, and free of blisters, loose mill scale, sand, dirt, and other foreign matter when installed. Before being placed in service, the interior of all lines shall be thoroughly cleaned, to the satisfaction of OWNER'S REPRESENTATIVE.

3.8 ACCEPTANCE

- A. Owner reserves the right to have any section of the piping system that he suspects may be faulty cut out of the system by CONTRACTOR for inspection and testing. Should the joint prove to be sound, Owner will reimburse CONTRACTOR on a time-and-material basis as specified in the Contract. Should the joint prove to be faulty, the destructive test will continue joint by joint in all directions until sound joints are found. Costs for replacement of faulty work and/or materials shall be the responsibility of CONTRACTOR.

END OF SECTION 15020

SECTION 15061 - DUCTILE IRON PIPE

PART 1 - GENERAL

1.1 SCOPE

- A. This section covers the furnishing and installation of ductile iron pipe. Ductile iron pipe shall be furnished complete with all fittings, jointing materials, pipe hangers and supports, anchors, blocking, encasement, and appurtenances. Piping furnished hereunder shall be complete with all joint gaskets, bolts, and nuts required for installation of any valves and equipment for installation under this contract. Pipe hangers and supports, pressure and leakage testing, cleaning, disinfection, and cathodic protection are covered in other Sections.

1.2 SUBMITTALS

- A. Drawings, details, specifications, and installation schedules covering all ductile iron pipe and accessories shall be submitted in accordance with the Submittals section. The Drawings and data shall include, but shall not be limited to, the following:
1. Certification by manufacturer for each item furnished in accordance with the ANSI/AWWA Standards.
 2. Certification of gaskets, certifying that gasket material is suitable for services intended.
 3. Certification of proof-of-design tests for joints.
 4. Certification of proof-of-design tests for welded-on outlets.

1.3 SHIPPING, HANDLING, AND STORAGE

- A. Shipping, handling and storage shall be in accordance with Specification Section 01612. Pipe, fittings, and accessories shall be handled in a manner that will ensure installation in sound, undamaged condition. Equipment, tools, and methods used in handling and installing pipe and fittings shall not damage the pipe and fittings. Hooks inserted in ends of pipe shall have broad, well-padded contact surfaces. Unpadded hooks, wire brushes or other abrasive tools shall not be permitted to come into contact with polyethylene lining if such lining is specified. Contractor furnished pipe and fittings in which the lining has been damaged shall be replaced by and at the expense of Contractor. With the concurrence of Owner's Representative, small and readily accessible damaged areas may be repaired. Where the damaged areas are small and readily accessible, Contractor may be permitted to repair the lining. Contractor shall repair any damage to pipe coatings before the pipe is installed.

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PART 2 - PRODUCTS

2.1 MATERIALS

- A. Pipe Type Code: DIP1 - Ductile iron, ANSI/AWWA C151/A21.51, Table 1 or Table 3. Minimum Pressure Class: 4 to 12 Inches – 350, 14 to 20 Inches - 250.
- B. Gaskets - All Joint Types - Synthetic rubber; natural rubber will not be acceptable. Gaskets for potable water service shall be certified as suitable for chlorinated and chloraminated potable water; a certificate of gasket suitability shall be submitted. Gaskets shall be furnished by the pipe manufacturer.
- C. Fittings - ANSI/AWWA C110/A21.10 (except shorter laying lengths will be acceptable for U.S. Pipe), or ANSI/AWWA C1 53/A21.53, minimum working pressure rating as follows, unless indicated otherwise on the drawings.
 - 1. Fitting Size (inch) – Material - Type - Minimum Working Pressure Rating (psig)
 - 4 to 24 Inches – Ductile Iron - Mechanical and Push-On Joints - 350 psig
 - 4 to 24 Inches – Ductile Iron - Flanged Joints – 250 psig
 - 2. All fittings shall be ductile iron and suitable for a factory test pressure of 1.5 times rated working pressure without leakage or damage.
- D. Push-on Joints
 - 1. Restrained Push-on Joints, gaskets with stainless steel gripping segments, (4 inch through 12 inch) - American "Fast Grip" or "Field Lok 350 Gasket" manufactured by U.S. Pipe and furnished to licensed Tyton® joint manufacturer.
 - 2. Restrained Push-on Joints, locking wedge type; (4 inch through 24 inch) - EBAA Iron "Megalug" Series 1700; U.S. Pipe "TR Flex Gripper Ring"; Star Pipe Products "StarGrip 3100"; or American "Field Flex Ring", without exception.
 - 3. Restrained Push-on Joints, positive locking segments and/or rings, (4 inch through 64 inch) - American "Flex-Ring," or "Lok-Ring"; Clow "Super-Lock"; U.S. Pipe "TR Flex"; or Griffin "Snap-Lok."
- E. Flanged Joints - ANSI/AWWA C115/A21.15.
 - 1. Flanges Class 125 - Ductile iron, flat faced, with ANSI/ASME B16.1, Class 125 diameter and drilling. All flanges shall be suitable for test pressure of 1.5 times rated pressure without leakage or damage.
 - 2. Flange Bolts - ASTM A307, chamfered or rounded ends projecting 1/4 to 1/2 inch beyond outer face of nut.
 - 3. Flange Nuts - ASTM A307, hexagonal, ANSI/ASME B 18.2.2, heavy semi-finished pattern.

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4. Flange Gaskets - ASTM D1330, Grade I rubber, full face type, 1/8 inch thick. Gaskets shall be furnished by the pipe manufacturer. Gaskets for potable water service shall be certified as suitable for chlorinated potable water; a certificate of gasket suitability shall be submitted.
- F. Insulated Flanges - As specified herein, except bolt holes shall be enlarged as needed to accept bolt insulating sleeves.
- G. Insulation Kits - As manufactured by Central Plastics or PSI Industries.
1. Insulating Gaskets - Type E, NEMA G-10 glass reinforced epoxy, 1/8 inch thick, with Buna-N sealing element for water and air service. For wastewater service use Viton sealing element. Gaskets shall be furnished by the pipe manufacturer. Gaskets for potable water service shall be certified as suitable for chlorinated potable water; a certificate of gasket suitability shall be submitted.
 2. Bolt Insulating Sleeves - Mylar, 1/32 inch thick.
 3. Insulating Washers - Phenolic laminate, 1/8 inch thick, two for each flange bolt.
 4. Backing Washers - Steel, 1/8 inch thick, two for each flange bolt.
- H. Mechanical Joints - ANSI/AWWA C111/A21 .11.
1. Restrained Mechanical Joints (factory prepared spigot), (4 inch through 48 inch) - American "MJ coupled Joints", or Griffin "Bolt-Lok" or "Mech-Lok".
 2. Restrained Mechanical Joints, (field cut spigot), (4 inch through 20 inch) - EBAA Iron "Megalug" Series 1100, without exception.
 3. Wall Castings - Mechanical joint with water stop and tapped holes; single casting or fabricated ductile iron; holes sized in accordance with the details on the Drawings and provided with removable plugs.
 4. Mechanical Joints with Tie Rods - ASTM A307.

Tie Rods - ASTM A307.

Steel Pipe - ASTM A53, Schedule 40 or 80 as indicated on the drawings.

Washers - ANSI/ASME B18.22.1, plain steel.
- I. Threaded Connections - ANSI/ASME B1.20.1, NPT; with boss or tapping saddle wherever wall thickness minus the foundry tolerance at the tapped connection is less than that required for 4-thread engagement as set forth in Table A.1, Appendix A, of ANSI/AWWA C151 /A21.51.
- J. Mechanical Couplings
1. Restrained Couplings – EBBA Iron 3800 Mega-Coupling.
 2. Gaskets - Oil-resistant synthetic rubber. Gaskets shall be furnished by the pipe

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manufacturer. Gaskets for potable water service shall be certified as suitable for chlorinated potable water; a certificate of gasket suitability shall be submitted.

- K. Tapping Saddles - Ductile iron, with steel straps and rubber sealing gasket, 250 psi pressure rating.
- L. Flanged Coupling Adapters - Restrained (4 inch through 12 inch) – EBBA Iron 2100 Megaflange.
- M. Flanged Flexible Couplings – Metraflex, Metrasphere Style R.
- N. Dismantling Joints - Romac "DJ400"; Dresser "Style 131 Dismantling Joint" or Viking Johnson. For use in potable water systems, coating to be in accordance with NSF-61. Bolts, nuts, and tie rods shall be stainless steel ASTM A304 or A316.
- O. Watertight/Dust-tight Pipe Sleeves - Thunderline Corporation "Link-Seal", insulating type with modular rubber sealing elements, nonmetallic pressure plates, and stainless steel bolts and nuts.
- P. Polyethylene Encasement - Seamless, ANSI/AWWA C105/A21.5; LLDPE - 8 mil or HDCLPE - 4 mil.

2.2 SHOP COATING AND LINING

- A. The interior of all pipe and fittings, unless noted otherwise, shall be cement mortar lined and seal coated as per ANSI/AWWA C104/A21.4.
 - 1. The exterior surfaces of all pipe and fittings shall be as per the Piping Schedule in Section 01630.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Pipe and fittings shall be carefully examined for cracks and other defects immediately before installation; spigot ends shall be examined with particular care. All defective pipe and fittings shall be removed from the site.

3.2 PREPARATION

- A. The interior of all pipe and fittings shall be thoroughly cleaned of all foreign matter prior to installation. Before jointing, all joint contact surfaces shall be wire brushed if necessary, wiped clean, and kept clean until jointing is completed.
- B. Precautions shall be taken to prevent foreign material from entering the pipe during installation. Debris, tools, clothing, or other objects shall not be placed in or allowed to enter the pipe.

3.3 CUTTING PIPE

- A. Cutting shall be done in a neat manner, without damage to the pipe or the lining. Cuts shall be smooth, straight, and at right angles to the pipe axis. After cutting, the ends of the pipe shall be dressed with a file or a power grinder to remove all roughness and sharp edges. The cut ends of push-on joint pipe shall be suitably beveled.
- B. All field cutting of existing gray cast iron pipe shall be done with mechanical pipe cutters, except where the use of mechanical cutters would be difficult or impracticable. Contractor shall use factory prepared pipe ends unless a field cut is required for connections. Ends of ductile iron pipe shall be cut with a portable guillotine saw, abrasive wheel, saw, milling cutter, or oxyacetylene torch. The use of hydraulic squeeze type cutters will not be acceptable. Field-cut holes for saddles shall be cut with mechanical cutters; oxyacetylene cutting will not be acceptable.

3.4 ALIGNMENT

- A. Piping shall be laid to the lines and grades indicated on the drawings. Pipelines or runs intended to be straight shall be laid straight. Deflections from a straight line or grade shall not exceed the values stipulated in Table 3 or Table 4 of AWWA C600, unless specially designed bells and spigots are provided. Either shorter pipe sections or fittings shall be installed where needed to conform to the alignment or grade indicated on the drawings. When pipelines must be closely controlled, laser beam equipment, surveying instruments, or other suitable means shall be used to maintain alignment and grade. At least one elevation reading shall be taken on each length of pipe. If laser beam equipment is used, periodic elevation measurements shall be made with surveying instruments to verify accuracy of grades. If such measurements indicate thermal deflection of the laser beam due to differences between the ground temperature and the air temperature within the pipe, precautions shall be taken to prevent or minimize further thermal deflections.

3.5 LAYING PIPE

- A. Buried pipe shall be protected from lateral displacement by placing the specified pipe embedment material. Under no circumstances shall pipe be laid in water, and no pipe shall be laid under unsuitable weather or trench conditions.
- B. Whenever pipe laying is stopped, the open end of the pipe shall be sealed with a watertight plug, which will prevent trench water from entering the pipe.
- C. Pipe shall be laid with the bell ends facing the direction of laying, except where reverse laying is specifically acceptable by Owner's Representative.

3.6 FIELD JOINTS

- A. Joints in buried locations shall be mechanical type unless otherwise indicated on the Drawings. Bells on wall castings and wall sleeves shall be mechanical joint type, with tapped holes for tie rods or stud bolts. All other joints shall be flanged unless otherwise indicated on the Drawings. Certification of joint design shall be provided in accordance with ANSI/AWWA C111/A21.11, Section 4.5, Performance Requirements, as modified herein. The joint test pressure shall be not less than 2 times the working pressure or 1-1/2 times the test pressure of the pipeline, whichever

is higher. The same certification and testing shall also be provided for restrained joints. For restrained joints, the piping shall not be blocked to prevent separation and the joint shall not leak or show evidence of failure. It is not necessary that such tests be made on pipe manufactured specifically for this project. Certified reports covering tests made on other pipe of the same size and design as specified herein and manufactured from materials of equivalent type and quality may be accepted as adequate proof of design.

- B. Restrained joints shall be extended after they are assembled to minimize further takeup.
- C. Field closure pieces shall be located away from the bends beyond the length over which joints are to be restrained.
- D. Where acceptable to Owner's Representative, grooved couplings may be used instead of flanges, provided that rigid grooving is used to preclude longitudinal pipe movement and angular deflection at joints. Fittings, valves, and equipment installed using grooved couplings shall be adequately supported and blocked or restrained to prevent rotation.

3.7 MECHANICAL JOINTS

- A. Mechanical joints shall be carefully assembled in accordance with the manufacturer's recommendations. If effective sealing is not obtained, the joint shall be disassembled, thoroughly cleaned, and reassembled. Bolts shall be uniformly tightened to the torque values listed in Appendix A of ANSI/AWWA C111/A21.11. Overtightening of bolts to compensate for poor installation practice will not be acceptable. The holes in mechanical joints with tie rods shall be carefully aligned to permit installation of the tie rods. In flange and mechanical joint pieces, holes in the mechanical joint bells and the flanges shall straddle the top (or side for vertical piping) centerline. The top (or side) centerline shall be marked on each flange and mechanical joint piece at the foundry.

- 3.8 PUSH-ON JOINTS. The pipe manufacturer's instructions and recommendations for proper jointing procedures shall be followed. All joint surfaces shall be lubricated with a soap solution provided by the pipe manufacturer immediately before the joint is completed. Lubricant shall be suitable for use in potable water, shall be stored in closed containers, and shall be kept clean. Each spigot end shall be suitably beveled to facilitate assembly.

Pipe ends for restrained joint pipe shall be prepared in accordance with the pipe manufacturer's recommendations.

3.9 FLANGED JOINTS

- A. Pipe shall extend completely through screwed-on flanges. The pipe end and flange face shall be finish machined in a single operation. Flange faces shall be flat and perpendicular to the pipe centerline.
- B. When bolting flanged joints, care shall be taken to avoid restraint on the opposite end of the pipe or fitting which would prevent uniform gasket compression or would cause unnecessary stress in the flanges. One flange shall be free to move in any direction while the flange bolts are being tightened. Bolts shall be tightened gradually and at a uniform rate, to ensure uniform compression of the gasket.
- C. Special care shall be taken when connecting piping to any pumping equipment to ensure that

piping stresses are not transmitted to the pump flanges. All connecting piping shall be permanently supported to obtain accurate matching of bolt holes and uniform contact over the entire surface of flanges before any bolts are installed in the flanges. Pump connection piping shall be free to move parallel to its longitudinal centerline while the bolts are being tightened. Each pump shall be leveled, aligned, and wedged into position which will fit the connecting piping, but shall not be grouted until the initial fitting and alignment of the pipe, so that the pump may be shifted on its foundation if necessary to properly install the connecting piping. Each pump shall, however, be grouted before final bolting of the connecting piping. After final alignment and bolting, the pump connections shall be tested for applied piping stresses by loosening the flange bolts which, if the piping is properly installed, should result in no movement of the piping relative to the pump or opening of the pump connection joints. If any movement is observed, the piping shall be loosened and re-aligned as needed and then the flanges bolted back together. The flange bolts shall then be loosened and the process repeated until no movement is observed.

3.10 FLANGED COUPLING ADAPTERS

- A. Flanged coupling adapters shall be installed in strict accordance with the coupling manufacturer's recommendations. After the pipe is in place and bolted tight, the proper locations of holes for the anchor studs shall be determined and the pipe shall be field-drilled. Holes for anchor studs shall be drilled completely through the pipe wall. Hole diameter shall be not more than 1/8 inch larger than the diameter of the stud projection.
- B. The inner surfaces of couplings shall be prepared for coating in accordance with instructions of the coating manufacturer and shall then be coated with liquid epoxy in accordance with ANSI/AWWA C210. The remaining surfaces, except flange mating surfaces, shall be cleaned and shop primed with universal primer.

3.11 MECHANICAL COUPLINGS

- A. Mechanical couplings shall be carefully installed in accordance with the manufacturer's recommendations. A space of at least 1/4 inch, but not more than 1 inch, shall be left between the pipe ends. Pipe and coupling surfaces in contact with gaskets shall be clean and free from dirt and other foreign matter during assembly. All assembly bolts shall be uniformly tightened so that the coupling is free from leaks, and all parts of the coupling are square and symmetrical with the pipe. Following installation of the coupling, damaged areas of shop coatings on the pipe and coupling shall be repaired to the satisfaction of Owner's Representative.
- B. The interior surfaces of the middle rings shall be prepared for coating in accordance with instructions of the coating manufacturer and shall then be coated with liquid epoxy in accordance with ANSI/AWWA C210. The remaining components shall be cleaned and shop primed with universal primer.

3.12 REDUCERS

- A. Reducers shall be eccentric or concentric as indicated on the drawings. Reducers of eccentric pattern shall be installed with the straight side on top, so that no air traps are formed.

3.13 CONNECTIONS WITH EXISTING PIPING

- A. Connections between new work and existing piping shall be made using fittings suitable for the

conditions encountered.

- B. Each connection with an existing pipe shall be made at a time and under conditions which will least interfere with service to customers, and as authorized by Owner. Facilities shall be provided for proper dewatering and for disposal of all water removed from dewatered lines and excavations without damage to adjacent property.
- C. Special care shall be taken to prevent contamination when dewatering, cutting into, and making connections with existing potable water piping. Trench water, mud, or other contaminating substances shall not be permitted to enter the lines. The interior of all pipe, fittings, and valves installed in such connections shall be thoroughly cleaned and then all potable water pipe, fittings, and valves shall be swabbed with, or dipped in, a 200 mg/L chlorine solution.

3.14 PRESSURE AND LEAKAGE TESTS

- A. Pipe and fittings shall be subjected to a pressure test and a leakage test in accordance with the Specification Sections 02704 and 15020. Pipe and fittings shall be subjected to a pressure test and a leakage test. The Contractor shall provide all necessary pumping equipment; piping connections between the piping and the nearest available source of test water; pressure gauges; and other equipment, materials, and facilities necessary for the tests. All pipe, fittings, valves, pipe joints, and other materials which are found to be defective shall be removed and replaced with new and acceptable materials, and the affected portion of the piping shall be retested by and at the expense of Contractor. All joints shall be watertight and free from visible leaks. Any visible leak which is discovered within the correction period stipulated in the General Conditions shall be repaired by and at the expense of Contractor.

3.15 CLEANING

- A. The interior of all pipe and fittings shall be kept clean of any foreign matter until the work has been accepted.

END OF SECTION 15061

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SECTION 15069 - CAST IRON SOIL PIPE AND ACCESSORIES

PART 1 - GENERAL

- 1.1 SCOPE. This section covers the furnishing of cast iron soil pipe and accessories for the service conditions as specified herein. Cast iron soil pipe shall be furnished complete with all fittings and other accessories.
- 1.2 SUBMITTALS.
- A. Drawings and Data. Complete specifications, data and catalog cuts or drawings shall be submitted in accordance with the Submittals section. Items requiring submittals shall include, but shall not be limited to, the following:
- Pipe, Gaskets, and Couplings.
- Name of Manufacturer.
- Type and Model.
- Construction materials, thickness, and finishes.
- 1.3 DELIVERY, STORAGE, AND HANDLING. Shipping shall be in accordance with the Shipping section. Handling and Storage shall be in accordance with the Handling and Storage section. All materials shall be stored in a sheltered location above the ground, separated by type, and shall be supported to prevent sagging or bending.

PART 2 - PRODUCTS

2.1 MATERIALS.

Pipe Type Code	CI1
Joint Type	Bell and Spigot
Service	Building sanitary drain, waste, and vent piping, all locations. Building storm drain piping, all locations.
Pipe and Fittings	ASTM A74
Jointing Material	Rubber gaskets, ASTM C564.

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Pipe Type Code	CI2
Joint Type	Hubless Pipe and Fittings
Service	Building sanitary drain, waste, and vent piping, all locations except where buried. Building storm drain piping, all locations except where buried.
Pipe and Fittings	CISPI 301.
Jointing Material	Heavy duty coupling, with neoprene rubber sleeve, 304 stainless steel shield, and stainless steel clamping bands, or bolted cast iron coupling with stainless steel bolts and neoprene gasket. Couplings shall be Clamp-All Products "HI-TORQ 125", Husky "SD 4000", or MG Piping Products "MG Coupling", without exception.

PART 3 - EXECUTION

- 3.1 INSTALLATION. Materials furnished under this section will be installed in accordance with the Miscellaneous Piping and Accessories Installation section.

END OF SECTION 15069

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SECTION 15070 - COPPER TUBING AND ACCESSORIES

PART 1 - GENERAL

- 1.1 SCOPE. This section covers the furnishing of copper tubing and accessories. Copper tubing shall be furnished complete with all fittings, flanges, unions, and other accessories specified herein.
- 1.2 SUBMITTALS.
- A. Drawings and Data. Complete specifications, data, and catalog cuts or drawings shall be submitted in accordance with the Submittals section. Submittals are required for all piping, fittings, gaskets, sleeves, and accessories, and shall include the following data:
- Name of Manufacturer
- Type and model
- Construction materials, thickness, and finishes Pressure and temperature ratings
- Contractor shall obtain and submit a written statement from the gasket material manufacturer certifying that the gasket materials are compatible with the joints specified herein and are recommended for the specified field test pressures and service conditions.
- 1.3 DELIVERY, STORAGE, AND HANDLING. Shipping shall be in accordance with the Shipping section. Handling and storage shall be in accordance with the Handling and Storage section. All materials shall be stored in a sheltered location above the ground, separated by type, and shall be supported to prevent sagging or bending.

PART 2 - PRODUCTS

- 2.1 MATERIALS. Copper tubing materials and service shall be as specified herein.

Pipe Type Code	CU1
Joint Type	Water Tubing with Flared Fittings
Service	Buried water supply beneath building slab, 2 inch and smaller..
Tubing	Soft annealed copper tubing, ASTM B88, Type K.
Fittings	Flared, material to match tubing. Fittings shall conform to ANSI/ASME B16.

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Pipe Type Code	CU2
Joint Type	Water Tubing with Brazed Joints
Service	Buried water supply, beneath building slab, 2-1/2 and 3 inch.
Tubing	Hard drawn copper tubing, ASTM B88, Type K.
Fittings	Brazed joint, material to match tubing. Fittings shall conform to ANSI B16.18 or ANSI/ASME B16.22.

Pipe Type Code	CU3
Joint Type	Water Tubing with Solder and Brazed Joints
Service	Potable and non-potable water supply, 3 inch and smaller. Hot water supply.
Tubing	Hard drawn copper tubing, ASTM B88, Type L, with the exception of LOX (liquid oxygen) piping which shall be Type K.
Fittings	Solder joint (smaller than 2 inch), Brazed joint (2 inch and larger and all sizes of LOX piping), material to match tubing. Fittings shall conform to ANSI B16.18, or ANSI/ASME B16.22.
Flanges	Where required for connection to equipment, valves, and accessories, ANSI B16.24, Class 150, cast bronze, brazed joint, with the exception of the LOX piping which shall be Class 300, cast bronze, brazed joint.

- D. Accessory Materials. Accessory materials for the copper tubing systems shall be as indicated.

Flange Bolts and Nuts	ASTM A307, Grade B, length such that, after installation, the bolts will project 1/8 to 3/8 inch beyond outer face of the nut.
Flange Gaskets	ASTM D1330, Grade I, red rubber, ring type, 1/8 inch thick.
Expansion Joints	Tempflex "Model HB Expansion Compensators" with copper tube ends.
Insulating Fittings	
Threaded	Dielectric steel pipe nipple, ASTM A53, Schedule 40, poly-propylene lined, zinc plated; Perfection Corp. "Clearflow Fittings".
Flanged	Epcor "Dielectric Flange Unions" or Central Plastics "Insulating Flange Unions".

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PART 3 - EXECUTION

- 3.1 INSTALLATION. Materials furnished under this section will be installed in accordance with the Miscellaneous Piping and Accessories Installation section.

END OF SECTION 15070

SECTION 15091 - MISCELLANEOUS BALL VALVES

PART 1 - GENERAL

1.1 SCOPE

- A. This section covers the furnishing of manually operated or remote activated two position (open-close) ball valves as specified herein. Piping, pipe supports, insulation, and accessories that are not an integral part of the valves or are not specified herein are covered in other sections.

1.2 GENERAL

- A. General Equipment Requirements: Specification Section 01610 - General Equipment Requirements shall apply to all equipment and materials furnished under this section. If the requirements in this section are different from those in the General Equipment Requirements, the requirements in the section shall take precedence.

1.3 SUBMITTALS

- A. Complete drawings, details, and specifications covering the valves and their appurtenances shall be submitted in accordance with the Submittals section. Included in the submittal shall be drawings by the valve manufacturer to indicate the position of the valve actuator and valve shaft.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Shipping, handling and storage shall be in accordance with Specification Section 01612.

PART 2 - PRODUCTS

2.1 CONSTRUCTION

Valve Type Code	VB1
Rating	150 psig non-shock cold WOG
Type	In-line, true union, full port (Schedule 80).
Body/Bonnet	PVC or CPVC to match piping system.
Seat	PVC or CPVC to match piping system.
Ball	PVC or CPVC to match piping system.
Stem	PVC or CPVC to match piping system.
Thrust Washer	Teflon.
Stem Seal	Viton O-ring.
Body Seals	Viton O-rings.
End Connection	Socket or Flanged, ASME B16.5, Class 150, raised face.
Temp. Limitations	0 to 140°F.
Valve Operator	Lever.
Manufacturers	Hayward Plastic Products "True Union Ball

	Valve"; Nibco "Chemtrol TU Series Tru-Bloc Ball Valve"; Spears Manufacturing Co "True Union 2000 Standard Series 3600 Ball Valve"

Valve Type Code	VB2
Rating	500 psig non-shock cold WOG, MSS SP-110
Type	In-line, two piece, end entry, full port.
Body/Bonnet	ASTM B584 – C84400 bronze.
Seat	Reinforced teflon.
Ball	Brass or chrome plated brass.
Stem	Brass or bronze.
Thrust Washer	Reinforced teflon.
Stem Seal	Teflon or Viton.
End Connection	Threaded.
Temp. Limitations	-20 to 400°F.
Valve Operator	Lever.
Manufacturers	Conbraco Industries "Apollo 77-100 Series" or Powell "Fig 4210T".

Valve Type Code	VB3
Rating	800 psig non-shock cold WOG, MSS SP-110
Type	In-line, two piece, end entry, regular port.
Body/Bonnet	ASTM A351 – CF8M.
Seat	Reinforced teflon.
Ball	ASTM A276-316, stainless steel.
Stem	ASTM A276-316, stainless steel.
Thrust Washer	Reinforced teflon.
Stem Seal	Teflon or Viton.
End Connection	Threaded.
Temp. Limitations	-20 to 400°F.
Valve Operator	Lever.
Manufacturers	Conbraco Industries "Apollo 76-100 Series" or Neles-Jamesbury "Series 4000".

- A. Ball valves shown on the drawing, but not specified herein, shall be selected to match piping material they are installed in.
- B. Length Tolerance. Unless otherwise specified, the actual length of valves shall be within plus or minus 1/16 inch of the specified or theoretical length.

2.2 VALVE ACTUATORS

- A. Ball valve, except those that are equipped with power actuators or are designed for automatic operation, shall be provided with manual actuators. Unless otherwise specified or indicated on the drawings, each manual actuator shall be equipped with a fever operator. Ball valves with center lines more than 7'-6" above the floor shall be provided with chain levers.

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2.3 ACCESSORIES

- A. If the drawings indicate the need for extension stems, stem guides; position indicator; floor boxes; valve boxes; or operating stands, refer to the Valve Actuator section.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Materials furnished under this section shall be installed in accordance with the Valve Installation section.

END OF SECTION 15091

SECTION 15093 - CHECK VALVES

PART 1 - GENERAL

1.1 SCOPE

- A. This section covers the furnishing of check valves as specified herein and as indicated in the Check Valve Schedule 15093-S01.

1.2 GENERAL

- A. Equipment furnished under this section shall be fabricated and assembled in full conformity with drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by Owner's Representative. Valves shall be furnished with all necessary parts and accessories indicated on the drawings, specified, otherwise required for a complete, properly operating installation and shall be the latest standard products of a manufacturer regularly engaged in the production of valves.
- B. General Equipment Requirements. Section 01610 - General Equipment Requirements shall apply to all equipment furnished under this section. If requirements in this specification differ from those in the General Equipment Requirements, the requirements specified herein shall take precedence.

1.3 SUBMITTALS

- A. Complete drawings, details, and specifications covering the valves and their appurtenances shall be submitted in accordance with the Submittals section. Included in the submittal shall be drawings by the valve manufacturer to indicate the position of the valve actuator and valve shaft. Submittal drawings shall clearly indicate the country of origin of all cast gray iron and ductile iron valve components.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Shipping, handling and storage shall be in accordance with Specification Section 01612.

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PART 2 - PRODUCTS

2.1 CONSTRUCTION

Valve Type	VC1
Application	Wastewater and sludge service.
Rating	Class 125 AWWA C508
Type	Horizontal Swing Check with Spring and Lever, Bolted Bonnet
Body and Bonnet	ASTM A126 Class B Cast Iron.
Seat Ring	Bronze
Disc	Cast Iron (ASTM A126 Class B Cast Iron) with Synthetic Rubber Facing (ASTM D2000)
Hinge Pins	Stainless Steel
Cover Gasket	Manufacturer's Standard
Bushings	Bronze
End Connection	Flanged, ASME B16.1, Class 125, Flat Face.
Temperature Limitations	-20 to 212°F
Manufacturer	M&H "Style 259 -02A" or Mueller "2602-6-02"

- B. Shop Coatings. All ferrous metal surfaces of valves and accessories, both interior and exterior, shall be shop coated for corrosion protection. The valve manufacturer's standard coating will be acceptable, provided it is functionally equivalent to the specified coating.

1. Epoxy - For Liquid Service other than in potable water facilities - Ameron "Amercoat 385 Epoxy", Carboline "Carboguard 890", or Tnemec "Series N69 Hi-Build Epoxoline II".

- C. Surfaces to be Coated

1. Interior Surfaces - Epoxy.
2. Exterior Surfaces of Valves to Be Installed in Manholes or Valve Vaults - Epoxy.
3. Exterior Surfaces of All Other Valves - Universal primer.
4. Polished or Machined Surfaces - Rust-preventive compound.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Materials furnished under this section will be installed in accordance with Valve Installation Specification Section 15010.

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Schedule 15093-S01

Check Valve Schedule

Valve Tag Numbers	VC-1 VC-2 VC-3
Size (inches)	12
Valve Type	VC1

END OF SECTION 15093

SECTION 15102 - ECCENTRIC PLUG VALVES

PART 1 - GENERAL

1.1 SCOPE

- A. This section covers furnishing all eccentric plug valves as required by the Work and as indicated in the Eccentric Plug Valve Schedule at the end of the Section. Plug valves shall be furnished complete with actuators and accessories as specified herein, as indicated in the schedule, and as specified in the Valve Actuators section.

1.2 GENERAL

- A. Equipment provided under this section shall be fabricated and assembled in full conformity with drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Owner's Representative. Valves shall be furnished with all necessary parts and accessories indicated on the drawings, specified, or otherwise required for a complete, properly operating installation and shall be the latest standard products of a manufacturer regularly engaged in the production of valves.
- B. General Equipment Requirements. Section 01610 - General Equipment Requirements shall apply to all equipment and materials furnished under this section. If the requirements in this section are different from those in the General Equipment Requirements, the requirements in the section shall take precedence.
- C. Marking: Each valve shall be marked with the manufacturer's name, valve size, and pressure rating, and the country of origin of the body casting. All markings shall be cast on the exterior surface of the valve body. An identifying serial number shall be stamped on a corrosion-resistant plate attached to the valve body.
- D. Permanent Number Plates: All plug valves, except buried or submerged valves, that have been assigned a number on the drawings or in the Eccentric Plug Valve Schedule, shall be provided with a permanent number plate as per Specification Section 10400. The location of number plates and the method of fastening shall be acceptable to Owner's Representative. Numerals shall be at least 1 inch high and shall be black baked enamel on anodized aluminum plate.

1.3 SUBMITTALS

- A. Complete drawings, details, and specifications covering the valves and their appurtenances shall be submitted in accordance with the Submittals section. Submittal drawings shall clearly indicate the country of origin of all cast gray iron and ductile iron valve components. Drawings shall include separate wiring diagrams for each electrically operated or controlled valve and the electrical control equipment. Each drawing shall be identified with the valve number or name as specified in this section. Certified copies of reports covering proof-of-design testing of valves as set forth in Section 5 of ANSI/AWWA C504, with an affidavit of compliance as indicated in Section 6.3 of C504, shall be submitted to Owner's Representative before the valves are shipped.

1.4 DELIVERY, STORAGE, AND HANDLING

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- A. Shipping, handling and storage shall be in accordance with Specification Section 01612.

PART 2 - PRODUCTS

- 2.1 MATERIALS. Materials used in the manufacture of eccentric plug valves shall be as indicated:

Valve Type Code	VP1
Body	Cast iron, ASTM A126, Class B; or ductile iron, ASTM A536, Grade 65-45-12.
Plug	Cast iron, ASTM A126, Class B; or ductile iron, ASTM A536, Grade 65-45-12.
Plug Facing	Chloroprene, Neoprene or Buna-N, 70 Type A durometer hardness in accordance with ASTM D2240.
Body Seat	Welded nickel overlay.
Upper and Lower Trunnion Bearings	Sleeve type; stainless steel or bronze.
Upper Thrust Bearing	TFE, Nylatron, or Delrin.
Stem Seal	V-type packing or U-cups, Buna-N or TFE.
Manufacturers	DeZurik, Pratt, Milliken, Val-Matic, Clow, or Victaulic, or approved equal.

- A. The following are acceptable shop coatings.

Epoxy	For Liquid Service other than in potable water facilities - Ameron "Amercoat 385 Epoxy", Carboline "Carboguard 890", or Tnemec "Series N69 Hi-Build Epoxoline II".

2.2 VALVE CONSTRUCTION

- A. Valve Body: The valve port area of each valve shall be 100 percent of the cross section of the connecting piping. Valves shall provide tight shutoff at the rated pressure from either direction. An adjustable closed position plug stop shall be provided.

Each valve body shall be plainly marked to indicate the seat end. The actual length of 10 inch and smaller valves shall be within plus or minus 1/16 inch of the theoretical length. The actual length of 12 inch and larger valves shall be within plus or minus 1/8 inch of the theoretical length.

Valve ends shall be compatible with connecting piping. All valves shall have flanged, grooved or mechanical joint ends as indicated in the Eccentric Plug Valve Schedule. Flange diameter and drilling shall conform to ANSI B16.1, Class 125. Flanges shall be flat faced and finished to true plane surfaces within a tolerance limit of 0.005 inch. The finished face shall be normal to the longitudinal valve axis within a maximum angular variation tolerance of 0.002 inch per foot of flange diameter. Grooved end dimensions shall conform to AWWA C606, Table 5, for rigid joints. When grooved end valves are to be installed in flanged piping, two flange adapters compatible with the connecting piping shall be provided with each valve. Mechanical joint ends shall conform to ANSI/AWWA C111/A21.11.

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Valve bodies shall be rated for a working pressure as indicated on the Eccentric Plug Valve Schedule.

- B. Plug: The plug shall be of one-piece construction and shall have a cylindrical or spherical seating surface eccentrically offset from the center of the plug shaft. The interference between the plug face and the body seat, with the plug in the closed position, shall be externally adjustable in the field with the valve in the line under pressure. Plug surfaces shall be faced with a resilient material.
- C. Seats: Seats shall be cast in the body and shall have raised, welded-in nickel overlay not less than 0.050 inch thick on all surfaces in contact with the plug face. The overlay shall be at least 90 percent nickel and have a Brinell hardness of 200 or greater.
- D. Stem Seals: The valve shaft shall be sealed by U-cups or by at least four self-adjusting chevron type packing rings.

2.3 VALVE ACTUATORS

- A. Requirements for valve actuators shall be as specified herein, as indicated in the Eccentric Plug Valve Schedule, and as specified in the Valve Actuators Section 15180. Valve actuators shall be manual or electric.
- B. Geared actuators with hand wheels shall be provided for manually operated valves.
- C. Geared actuators for plug valves not listed in the Eccentric Plug Valve Schedule shall be rated for a differential pressure across the valve, on the seating side, of 100 psi for 8-inch and smaller valves, 50 psi for 10-inch and larger valves.

- 2.4 SHOP PAINTING. All interior and exterior ferrous metal surfaces, except bearing and finished surfaces and stainless steel components of valves and accessories, shall be shop painted for corrosion protection. The valve manufacturer's standard coating will be acceptable, provided it is functionally equivalent to the specified coating and is compatible with the specified field painting. Surfaces shall be painted as follows:

Interior Surfaces	Epoxy.
Exterior Surfaces of Valves to Be Buried, Submerged, or Installed in Manholes or Valve Vaults	Coal tar epoxy.
Exterior Surfaces of All Other Valves	Universal primer.
Polished or Machined Surfaces	Rust-preventive compound.

Interior epoxy coatings shall comply with AWWA C550 and shall be free of holidays. The total dry film thickness of shop-applied coatings shall be not less than:

Epoxy - 10 mils

Universal Primer - 3 mils

2.5 ACCESSORIES

- A. Requirements for extension stems and stem guides, position indicators, floor boxes, operating

stands, and valve boxes shall be as indicated in the Eccentric Plug Valve Schedule and as indicated on the Drawings and as specified in the Valve Actuators section.

2.6 TESTING

- A. Except as modified herein, eccentric plug valves shall be tested in accordance with Section 5 of ANSI/AWWA C517. Each valve shall be performance tested in accordance with Section 5.2 and shall be given a leakage test and a hydrostatic test as described in Sections 5.2.2 and 5.2.3. The leakage test shall be applied to the seating face of the plug (tending to unseat the plug) at the rated pressure of the valve. Each valve shall be leak tight in both directions when closed by the actuator with the maximum differential pressure applied to the plug as specified in the Eccentric Plug Valve Schedule.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Valves will be installed in accordance with the Valve Installation Section 15010.

Schedule 15102-S01 - Eccentric Plug Valve Schedule

Valve Tag Numbers	VP-1 VP-2 VP-3
Type	VP1
Size (inches)	12
Rated Working Pressure (psi)	40
Type of Service	Open-Close
Type of Installation	
Ends	Flanged
Maximum Differential Pressure (psi)	40
High Pressure Side of Plug	Seating
Type of Manual Actuator	Geared Actuator with Handwheel
Type of Electric Actuator	NA
Operating time (seconds)	NA
Power for Electric Actuator	NA
Number of Limit Switches	NA
NEMA Type of Controller Enclosure	NA
Controller Auxiliary Contacts Required	NA
Open-Stop-Close Push Buttons	NA
Local-Off-Remote Switch	NA
Red and Green Indicating Lights	NA
Extension Stems	NA
Position Indicator for Buried Actuator	NA
Floor Box	NA
Cast Iron Operating Stand	NA

15102-5

SECTION 15108 - AIR RELEASE AND COMBINATION AIR VALVES

PART 1 - GENERAL

1.1 SCOPE

- A. This Section covers furnishing air release valves, combination air valves, and air release and vacuum relief valves as required by the Work, and as indicated on the Contract Drawings.

1.2 GENERAL

- A. Equipment provided under this section shall be fabricated and assembled in full conformity with drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Owner's Representative. Valves shall be furnished with all necessary parts and accessories indicated on the drawings, specified, or otherwise required for a complete, properly operating installation and shall be the latest standard products of a manufacturer regularly engaged in the production of valves.
- B. General Equipment Requirements. Section 01610 - General Equipment Requirements shall apply to all equipment furnished under this section. If requirements in this specification differ from those in the General Equipment Requirements, the requirements specified herein shall take precedence.
- C. Governing Standard. Except as modified or supplemented herein, all valves furnished under this section shall conform to the applicable requirements of AWWA C512.
- D. Permanent Number Plates. All valves that have been assigned a number on the drawings shall be provided with a permanent number plate. The location of number plates and the method of fastening shall be acceptable to Owner's Representative. Numerals shall be at least 1 inch high and shall be black baked enamel on anodized aluminum plate. Permanent number plates shall be as specified in Specification Section 10400.

1.3 SUBMITTALS

- A. Complete assembly drawings, together with detailed specifications and data covering materials used and accessories forming a part of the valves furnished, shall be submitted in accordance with the Specification Section 01300.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Shipping, handling and storage shall be in accordance with Specification Section 01612.

PART 2 - PRODUCTS

2.1 CONSTRUCTION.

Valve Type Code	VAR1
Application	Air release valves for wastewater applications with operating pressures of 150 psi or less.
Valve Trim	Bronze or austenitic stainless steel.
Float	Austenitic stainless steel.
Manufacturer and Model	Apco Valve and Primer "S-400", Multiplex "Crispin SL", or Val-Matic "48A".
Shop Coatings	
Epoxy (NSF-61 Certified)	PPG Amercoat "Amerlockt 400 High Solids Epoxy", Carboline "Carboguard 891", Sherwin-Williams "Macropoxy 646NSF" or Tnemec "Series N140 Pota-Pox Plus".
Rust-preventive compound.	As recommended by the Manufacturer.

2.2 SHOP PAINTING

- A. All interior and exterior ferrous metal surfaces, except stainless steel components, shall be shop painted for corrosion protection. The valve manufacturer's standard coating will be acceptable, provided it is functionally equivalent to the specified coating and is compatible with the specified field coating. Field painting is covered in the Section 09940. Surfaces shall be painted as indicated:
1. Interior Surfaces – Epoxy (NSF-61 Certified).
 2. Exterior Surfaces of All Other Valves - Universal primer.
 3. Polished or Machined Surfaces - Rust-preventive compound.
 4. Interior epoxy coatings shall comply with AWWA C550 and shall be free of holidays.
- B. The total dry film thickness of shop-applied coatings shall be not less than:
1. Epoxy - 10 mils
 2. Universal Primer - 3 mils

2.3 SHUTOFF VALVES

- A. A shutoff valve shall be provided in the piping leading to each air release valve and combination air valve. Shutoff valves 3 inches and smaller shall be ball valves as specified in the Miscellaneous Ball Valves section. Shutoff valves 4 inches and larger for clean water service shall be AWWA Butterfly Valves.

PART 3 - EXECUTION

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INSTALLATION

- A. Air release and combination air valves will be installed in accordance with the Valve Installation Section 15180.

Schedule 15108-S01

Air Release and Combination Air Valve Schedule

Valve Tag Numbers	VAR-1
Size (inches)	3"
Valve Type	VAR1

END OF SECTION 15108

SECTION 15140 - PIPE SUPPORTS

PART 1 - GENERAL

1.1 SCOPE

- A. This section covers the furnishing and installation of pipe hangers, brackets, and supports.
- B. Pipe supports shall be furnished complete with all necessary inserts, bolts, nuts, rods, washers, and other accessories. This section also covers the spacing of expansion joints in piping systems. Expansion joint products and materials are covered in the respective piping sections.
- C. Concrete and fabricated steel supports shall be as indicated on the drawings, as specified in other sections, or, in the absence of such requirements, as permitted by OWNER'S REPRESENTATIVE.

1.2 GENERAL

- A. In certain locations, pipe supports, anchors, and expansion joints have been indicated on the drawings, but no attempt has been made to indicate every pipe support, anchor, and expansion joint. It shall be CONTRACTOR's responsibility to provide a complete system of pipe supports, to provide expansion joints, and to anchor all piping, in accordance with the requirements specified herein. Additional pipe supports may be required adjacent to expansion joints, couplings, or valves.
- B. All piping shall be rigidly supported and anchored so that there is no movement or visible sagging between supports.
- C. Pipe supports and expansion joints are not required in buried piping, but concrete blocking or other suitable anchorage shall be provided as indicated on the drawings or specified in other sections.
- D. Piping support system components shall comply with specified piping code requirements.
- E. Abbreviations. Reference to standards and organizations in this section shall be as indicated by the following designations.
 - 1. AISI - American Iron and Steel Institute
 - 2. ANSI - American National Standards Institute
 - 3. ASTM - American Society for Testing and Materials
 - 4. MSS - Manufacturers Standardization Society of Valve and Fitting Industry
- F. General Equipment Requirements: Section 01610 - General Equipment Requirements shall apply to all equipment provided under this section.

1.3 SUBMITTALS

- A. Complete data and catalog cuts or drawings covering fabricated pipe supports, fabricated inserts, and stainless steel, galvanized, and copper- and plastic-coated pipe supports shall be submitted in accordance with the submittals section. Data shall include a listing of the intended use and general location of each item submitted.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Unless otherwise indicated, all pipe supports shall comply with ANSI/MSS SP-58 and MSS SP-69. Materials of construction for fabricated steel supports are covered in the structural and miscellaneous metals section. All pipe support materials shall be packaged as necessary to ensure delivery in satisfactory condition.
- B. Unless otherwise specified or indicated on the drawings, pipe supports shall be fabricated of manufacturer's standard materials and provided with manufacturer's standard finish.
- C. Design loads for inserts, brackets, clamps, and other support items shall not exceed the manufacturer's recommended loads.
- D. Pipe supports shall be manufactured for the sizes and types of pipe to which they are applied. Strap hangers will not be acceptable. Threaded rods shall have sufficient threading to permit the maximum adjustment available in the support item. Continuously threaded rod is not acceptable for hanger rods over 12 inches in length.
- E. The use of supports which rely on stressed thermoplastic components to support the pipe will not be acceptable.
- F. Contact between dissimilar metals, including contact between stainless steel and carbon steel, shall be prevented. Supports for brass or copper pipe or tubing shall be copper plated. Portions of pipe supports which come into contact with other metals that are dissimilar shall be rubber or vinyl coated.
- G. Stainless steel supports shall be furnished, and shall be AISI Type 304 or 316 stainless steel. Stainless steel supports fabricated by welding shall be AISI Type 304L or 316L.
- H. Hot-dip galvanized supports shall be furnished and shall be in accordance with ASTM A153 and A385.
- I. Pipe support types and application shall comply with Table 1.

- 2.2 SEISMIC AND WIND LOADS. Seismic and wind loads shall be considered in the design for pipe supports. The applicable building code and design criteria are included in the structural general notes on the Drawings.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Concrete inserts or anchor bolts shall be used to support piping from new cast-in-place concrete. Expansion anchors shall be used to fasten supports to existing concrete and masonry.
- B. Anchorage shall be provided to resist thrust due to temperature changes, changes in diameter or direction, or dead-ending. Anchors shall be located as specified to force expansion and contraction movement to occur at expansion joints, loops, or elbows, and as needed to prevent excessive bending stresses and opening of mechanical couplings. Anchorage for temperature changes shall be centered between elbows and mechanical joints used as expansion joints. Anchorage for bellows type expansion joints may be located adjacent to the joint.
- C. When expansion joints are required, pipe guides shall be provided adjacent to bellows type expansion joints. Guides will not be required where mechanical couplings are permitted as expansion joints. Guides shall be located on both sides of expansion joints, except where anchors are adjacent to the joint. Unless otherwise indicated on the drawings, one guide shall be within four pipe-diameters from the joint and a second guide within 14 pipe diameters from the first guide. Pipe supports shall allow adequate movement; pipe guides shall not be used for support. Pipe guides shall be provided at locations as recommended by the manufacturer.
- D. Pipe supports for insulated cold piping systems shall be sized for the outside diameter of the insulated pipe, and an insulation protection shield shall be installed between the support and the insulation. Rigid insulation inserts shall be installed between the pipe and the insulation shields for piping larger than 2 inches or when needed to prevent crushing of the insulation. Inserts shall be of the same thickness as the adjacent insulation and shall be vapor sealed.
- E. Insulated hot piping systems shall be supported by clevises, clamps, support saddles, or rollers. Pipe clamps shall be attached directly to the pipe. Support saddles and rollers shall be sized for the outside diameter of the insulated pipe, and an insulation protection saddle shall be installed at the support.
- F. When supports for the FRP piping systems are in contact with less than 180 degrees of the pipe surface or when the width of the support is less than one-third the nominal pipe diameter (4 inches minimum), an FRP or steel saddle, shaped to the outside diameter of the pipe, shall be bonded to at least the bottom 120 degrees of the pipe.

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3.2 TYPES OF SUPPORTS

- A. The specific products for pipe supports shall be as indicated in Table 1 for the specified type and size of support.

TABLE 1 - TYPES OF SUPPORTS

Description and Size	Service	Type	MSS SP 69	Other
Hangers				
2-1/2 Inch and Smaller Pipe	For Hot and Cold Insulated Pipe	Clevis	1	B-Line "B3100" or Anvil "260".
2-1/2 Inch and Smaller Pipe	Other Service	J-Style	5	B-Line "B3690", Anvil "67", or Unistrut "J Hanger".
2-1/2 Inch and Smaller Pipe	Other Service	Clevis	1	B-Line "B3104" or Anvil "65".
3 through 10 Inch Pipe	For Hot Insulated Piping	Double Bolt	3	B-Line "B3144" or Anvil "295".
3 through 10 Inch Pipe	For Cold Insulated Piping	Clevis	1	B-Line "B3100" or Anvil "260".
3 through 10 Inch Pipe	For Un-Insulated Cold Piping	Clamp	4	B-Line "3140" or Anvil "212".
3 through 10 Inch Pipe	For Un-Insulated Cold Piping	Clevis	1	B-Line "B3100" or Anvil "260".
3 through 10 Inch Pipe	Other Services	Clevis	1	B-Line "B3100" or Anvil "260" for steel pipe; B-Line "B3102" or Anvil "590" for cast iron pipe.
12 Inch Pipe	All	Clevis or Saddle	1	See Drawings.
14 Inch and Larger Pipe	All	Saddle	NA	See Drawings.
Concrete Inserts, Steel				
12 Inch and Smaller Pipe	All		18	Channel 12 ga, Galv, 1-5/8 by 1-3/8 inches, min. 8 inches long, anchor lugs on 4 inch centers, at least three lugs, end caps, and filler strip.
14 Inch and Larger Pipe, Fabricated Insert, Except as Noted	All		NA	See Drawings.
Beam Clamps, Malleable Iron or Steel				

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Description and Size	Service	Type	MSS SP 69	Other
12 Inch and Smaller Pipe	All		21	B-Line "3050" and "3055" or Anvil "133" and "134".
12 Inch and Smaller Pipe	All		28, 29	Anvil "292".
12 Inch and Smaller Pipe	All		30	B-Line "3054" or Anvil "228".
Side Beam Bracket	All		34	B-Line "B3062" or Anvil "202".
Wall Supports and Frames, Steel				
12 Inch and Smaller Pipe	All	Brackets	32	B-Line "B3066" or Anvil "195".
12 Inch and Smaller Pipe	All	Brackets	33	B-Line "B3067" or Anvil "199".
12 Inch and Smaller Pipe	All	Prefabricated Channels	NA	12 ga , galv, 1-5/8 inches, with suitable brackets and pipe clamps.
1-1/2 Inch and Smaller Pipe	All	Offset Pipe Clamp	NA	Galv, 1-1/4 by 3/16 inch steel, with 3/8 inch bolts.
2 to 3-1/2 inch Pipe	All	Offset Pipe Clamp	NA	Galv, 1-1/4 by 1/4 inch steel, with 3/8 inch bolts.
Floor Supports, Steel or Cast Iron				
6 Inch and Smaller Pipe	All		37 with Base	B-Line " B3090 " or Anvil "259".
8 through 24 Inch Pipe	All		38	B-Line "83093" or Anvil "264".
Pipe Alignment Guides			NA	B-Line "B3281" through "B3287" or Anvil "255".
Turnbuckles, Steel			13	B-Line "B3202" or Anvil "230".
Hanger Rods, Carbon Steel, Threaded Both Ends, 3/8 Inch Minimum Size			NA	B-Line "B3205" or Anvil "140".
Weldless Eye Nut, Steel			17	B-Line "B3200" or Anvil "290".
Insulation Protection Saddle			39	B-Line "B3160 Series" or Anvil "160 Series".
Insulation Protection Shield			40	B-Line "B3151" or Anvil "167".

3.3 SUPPORT SPACINGS

- A. Pipe supports and expansion joints shall be spaced in accordance with Tables 2. Table 2 covers spacing for the standard operating conditions specified for each pipe material.

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- B. Pipe supports and expansion joints shall be spaced in accordance with Tables 2, 3, 4, and 5. Table 2 covers spacing for the standard operating conditions specified for each pipe material. Tables 3 and 4 cover PVC and FRP pipe spacing where operating conditions are in excess of the temperature and specific gravity requirements covered in Table 2. Table 5 covers PVC and FRP pipe that carries air or liquids with a specific gravity other than 1.0.

TABLE 2

MAXIMUM PIPE SUPPORT SPACINGS AT STANDARD TEMPERATURES AND SERVICES

Type of Pipe	Pipe Support Max Spacing	Max Run Without Expansion Joint, Loop or Bend (Note 1)	Expansion Joint Max Spacing (Note 2)	Type of Expansion Joints
	feet	feet	feet	
Cast Iron or Ductile Iron – All Diameters	15	80	80	Note 6
Copper for Hot Water				
1 inch and smaller	5	20	100	Note 3
Larger than 1 inch	7	20	100	Note 3
Copper for Services Other Than Hot Water				
1 inch and smaller	5			Note 7
Larger than 1 inch	7	50	100	Note 3
Steel and Stainless Steel, other than hot water heating service				
1-1/4 inch	7	30	100	Note 3
1-1/2 to 4 inch	10	30	100	Note 3
Over 4 inch	15	80	80	Note 3
Steel for hot water heating				
1-1/4 inch	7	30	100	Note 3
1-1/2 to 4 inch	10	30	100	Note 3
Over 4 inch	15	30	100	Note 3
FRP, for low pressure and odor control pipe at a maximum temperature of 150°F and a maximum specific gravity of 1.0.				
1 inch	4	60	100	Note 3
1-1/2 inch	4.5	60	100	Note 3
2 inch	5.5	60	100	Note 3
3 inch	6	60	100	Note 3
4 inch	6.5	40	100	Note 3
6 inch	7.5	40	100	Note 3
8 inch	8.5	40	100	Note 3
10 inch	9.5	40	100	Note 3
12 inch and Larger	10	40	100	Note 3
Polypropylene	6			Note 7

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Type of Pipe	Pipe Support Max Spacing	Max Run Without Expansion Joint, Loop or Bend (Note 1)	Expansion Joint Max Spacing (Note 2)	Type of Expansion Joints
	feet	feet	feet	
DWV				
PVDF DWV	6			Note 7
Cast Iron Soil Pipe	10			Notes 7 and 8
PVC, Schedule 80, for alum solution, caustic soda solution, ferric chloride solution, and hypochlorite solution at a maximum temperature of 100°F.				
1/8 and ¼ inch	Continuous Support	20	60	Note 3
½ inch	3.5	20	60	Note 3
¾ inch	4	20	60	Note 3
1 and 1-1/4 inch	4.5	20	60	Note 3
1-1/2 and 2 inch	5	20	60	Note 3
2-1/2 inch	5.5	20	60	Note 3
3 inch	6.5	20	60	Note 3
4 inch	7	20	60	Note 3
6 inch	8	20	60	Note 3
8 inch	9	20	60	Note 3
10 inch	9.5	20	60	Note 3
12 inch	10	20	60	Note 3
PVC, Schedule 80, for other services at a maximum temperature of 100°F and a maximum specific gravity of 1.0.				
1/8 and ¼ inch	Continuous Support	20	60	Note 3
½ inch	4	20	60	Note 3
¾ inch	4.5	20	60	Note 3
1 and 1-1/4 inch	5	20	60	Note 3
1-1/2 and 2 inch	5.5	20	60	Note 3
2-1/2 inch	6	20	60	Note 3
3 inch	7	20	60	Note 3
4 inch	7.5	20	60	Note 3
6 inch	8.5	20	60	Note 3
8 inch	9.5	20	60	Note 3
10 inch	10	20	60	Note 3
12 inch	10	20	60	Note 3
PVC, Schedule 40, for services at a maximum temperature of 100°F and a maximum specific gravity of 1.0.				
1/8 and ¼ inch	Continuous Support	20	60	Note 3
½ inch	3.5	20	60	Note 3
¾ inch	4	20	60	Note 3
1 and 1-1/4 inch	4.5	20	60	Note 3
1-1/2 and 2 inch	5	20	60	Note 3
2-1/2 inch	5.5	20	60	Note 3
3 inch	6	20	60	Note 3

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Type of Pipe	Pipe Support Max Spacing	Max Run Without Expansion Joint, Loop or Bend (Note 1)	Expansion Joint Max Spacing (Note 2)	Type of Expansion Joints
	feet	feet	feet	
4 inch	6.5	20	60	Note 3
6 inch	7.5	20	60	Note 3
8 inch	8	20	60	Note 3
10 inch	8.5	20	60	Note 3
12 inch	9.5	20	60	Note 3

Table 2 Notes:

1. Unless otherwise acceptable to Engineer, an expansion joint shall be provided in each straight run of pipe having an overall length between loops or bends exceeding the maximum run specified herein.
 2. Unless otherwise acceptable to Engineer, the spacing between expansion joints in any straight pipe run shall not exceed the maximum spacing specified herein.
 3. Expansion joint fittings are specified-in the respective piping Specification Sections.
 4. At least two properly padded supports for each pipe section.
 5. At least one support for each pipe section.
 6. Expansion joints shall be mechanical couplings.
 7. No expansion joints are required.
 8. Supports for 5 and 10 foot long pipe sections shall be located within 18 inches of each joint. Supports shall be positioned to maintain the piping alignment and to prevent the piping from sagging.
- B. Temperature Adjustments for PVC Pipe. PVC pipe at a temperature above 100°F shall have maximum support spacing in accordance with the following table. For insulated lines, reduce the support spacing to 70 percent of the listed values.

TABLE 3

MAXIMUM PIPE SUPPORT SPACINGS FOR PVC PIPE AT NON-STANDARD TEMPERATURES
(feet)

Nominal Size inches	Schedule 40		Schedule 80	
	120°F	140°F	120°F	140°F
¼	Continuous Support	Continuous Support	Continuous Support	Continuous Support
½	3	2.5	3.5	3
¾	3.5	3	4	3
1	3.5	3	4.5	3.5
1-1/4	4	3.5	4.5	4
1-1/2	4	3.5	5	4
2	4.5	3.5	5	4.5
3	5	4	6	5
4	5.5	4.5	6.5	5.5
6	6.5	5	8	6.5
8	7	5.5	8.5	7

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Nominal Size	Schedule 40		Schedule 80	
10	7.5	6	9	7.5
12	8	6.5	10	8.5

- C. Temperature Adjustments for FRP Pipe. FRP pipe at a temperature above and below 150°F shall have maximum support spacing in accordance with the following table.

TABLE 4

MAXIMUM PIPE SUPPORT SPACINGS FOR FRP PIPE AT NON-STANDARD TEMPERATURES
(feet)

Nominal Size (inches)	Temperature		
	75°F	175°F	200°F
1	5	3	2
1-1/2	6	3.5	2.5
2	7	4	3
3	7.5	4.5	3.5
4	8	5	4
6	10	6	4.5
8	11	6.5	5
10	12.5	7.5	5.5
12	13	8	6

- D. Specific Gravity Adjustments for PVC and FRP Pipe. PVC and FRP pipe shall have the maximum spacing indicated in Tables 2, 3, and 4 adjusted in accordance with the following table when the specific gravity of the liquid is greater than 1.0. Table 5 shall not apply to PVC pipe containing alum solution, caustic soda solution, ferric chloride solution, and hypochlorite solution, as these services are specifically covered in Table 2.

TABLE 5

MAXIMUM SUPPORT SPACING CORRECTION FACTORS FOR PVC AND FRP PIPE

Specific Gravity	Correction Factor
1.0	1.00
1.1	0.98
1.2	0.96
1.4	0.93
1.6	0.90
2.0	0.85
2.5	0.80
Air	1.40

3.4 INSTALLATION

- A. General: All piping shall be supported in a manner which will prevent undue stress on any valve, fitting, or piece of equipment. In addition, pipe supports shall be provided at changes in direction or elevation, adjacent to flexible couplings, and where otherwise shown. Pipe supports and

hangers shall not be installed in equipment access areas.

1. Where horizontal piping is arranged with two or more parallel lines, trapeze hangers may be used in lieu of individual hangers. Trapeze assembly shall consist of structure attachments as previously specified with rod size dependent upon total weight supported. Spacing of assemblies shall be determined by the minimum pipe size included in the group supported. Trapeze horizontal assemblies shall be structural angle or channel section of sufficient size to prevent measurable sag between rods. All lines shall be attached to the horizontal with intermediate pipe guides and U-bolts or one-hole clamps. Pre-engineered support equipment may be used when selected and installed in accordance with the manufacturer's recommendations.
 2. No copper pipe shall contact a pipe support or hanger of dissimilar metal. Hangers and supports for copper pipe shall be copper-plated, plastic coated, or copper pipe shall be galvanically isolated using Neoprene strips or other material as approved.
 3. No piping shall be supported from the pipe above.
 4. Horizontal piping hanger support rods shall attach to steel beams with center-loading I-clamps, or welded beam clips. Hanger support rods shall attach to concrete slabs or beams with inserts.
 5. Anchorage shall be provided to resist both lateral and longitudinal seismic forces. Seismic forces shall be calculated assuming the pipes are full.
- B. Inserts. Reference building structural concrete drawings for concrete inserts. When not provided as part of the building concrete structure, provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
1. Where concrete slabs form finished ceilings, provide inserts flush with the slab surface.
 2. Where inserts are omitted, drill through concrete slab from below and provide thru-bolt with recessed square steel plate and nut recessed into and grouted flush with slab. X-ray locate existing reinforcing rods before drilling.
- C. Pipe Hangers and Supports. Hanger rod sizing for copper pipe and plastic pipe shall be same as for steel pipe. Install hangers to provide a minimum 1/2 inch space between finished covering and adjacent work.
1. A hanger shall be placed with 18 inches of each horizontal elbow, and on both sides of all piping accessories and valves weighing 20 lbs or more.
 2. Hangers shall have 1-1/2 inches minimum vertical adjustment.
 3. Support horizontal cast iron, ductile iron and no-hub piping systems adjacent to each joint. Support vertical piping at every floor using riser clamps.
 4. Support riser piping independently of connected horizontal piping.
 5. Hanger and hanger components shall be sized specifically for the pipe size it is to be used on.

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3.5 PLACEMENT

- A. Unless closer spacing is indicated on the drawings, the maximum spacing for pipe supports and expansion joints shall be as indicated in Tables 2.
 - 1. Unless otherwise indicated on the drawings or acceptable to OWNER'S REPRESENTATIVE, piping shall be supported approximately 1-1/2 inches out from the face of walls and at least 3 inches below ceilings.

END OF SECTION 15140

SECTION 15180 - VALVE ACTUATORS

PART 1 - GENERAL

1.1 SCOPE

- A. This section covers furnishing manual and powered valve actuators and accessories as specified herein.

1.2 GENERAL

- A. Equipment provided under this section shall be fabricated and assembled in full conformity with drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Owner's Representative. Actuators shall be furnished with all necessary parts and accessories indicated on the drawings, specified, or otherwise required for a complete, properly operating installation and shall be the latest standard products of a manufacturer regularly engaged in the production of actuators.
- B. Governing Standards. Except as modified or supplemented herein, all powered actuators shall conform to applicable requirements of ANSI/AWWA C540.

Except as modified or supplemented herein, all manual and cylinder actuators for butterfly and eccentric plug valves shall conform to the applicable requirements of ANSI/AWWA C504.

Except as modified or supplemented herein, all manual actuators for ball valves shall conform to the applicable requirements of ANSI/AWWA C507.

- C. Marking: Each actuator shall be marked with the manufacturer's name, model number, and the country of origin. An identifying serial number shall be stamped on a corrosion-resistant plate attached to the actuator.
- D. Temporary Number Plates: Each actuator shall be factory tagged or marked to identify the actuator and the applicable valve by number or service as indicated in the valve schedule.

1.3 SUBMITTALS

- A. Complete drawings, details, and specifications covering the actuators and their appurtenances shall be submitted in accordance with the General Specifications and Special Project Conditions. Submittal drawings shall clearly indicate the country of origin of each actuator and its components. The drawings shall include separate wiring diagrams for each electrically operated or controlled actuator and the electrical control equipment. Each actuator drawing shall be identified with the respective valve number or name.

For networked actuators, information on the available input and output assemblies shall be submitted for the protocol(s) specified to be provided.

For electric or cylinder actuators, certified copies of reports covering proof-of-design testing of the actuators, as set forth in Section 5 of ANSI/AWWA C540, together with an affidavit of

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compliance as indicated in Section 6.3 of ANSI/AWWA C540, shall be submitted to Owner's Representative before the actuators are shipped.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Shipping, handling and storage shall be in accordance with the General Specifications and Special Project Conditions.

PART 2 - PRODUCTS

2.1 PERFORMANCE AND DESIGN REQUIREMENTS

- A. General: Actuators and appurtenances shall be designed for the conditions and requirements as indicated in the respective valve sections.

Liberal factors of safety shall be used throughout the design, especially in the design of parts subject to intermittent or alternating stresses. In general, working stresses shall not exceed one-third of the yield point or one-fifth of the ultimate strength of each material.

- B. Valve Actuators: Each actuator shall be designed to open or close the valve under all operating conditions. Actuators shall be designed for the maximum pressure differential across the valve and maximum velocities through the valve where indicated in the respective valve schedules.

Valve actuators shall be provided and adjusted by the valve manufacturer. Actuator mounting arrangements and positions shall facilitate operation and maintenance and shall be determined by the valve manufacturer unless indicated otherwise on the drawings or directed by Owner's Representative. When valves are to be buried, submerged, or installed in vaults, the actuators and accessories shall be sealed to prevent the entrance of water. The design water depth shall be as indicated in the respective valve schedules but not less than 20 feet.

2.2 MATERIALS

- A. Except as modified or supplemented herein, materials used in the manufacture of actuators shall conform to the requirements of ANSI/AWWA C504 and C540.

2.3 MANUAL VALVE ACTUATORS

- A. General: Manual actuators of the types listed in the valve specifications or schedules shall be provided by the valve manufacturer.

Unless otherwise indicated or specified, each geared manual actuator shall be equipped with an operating hand wheel.

The direction of rotation of the wheel, wrench nut, or lever to open the valve shall be to the left (counterclockwise). Each valve body or actuator shall have cast thereon the word "Open" and an arrow indicating the direction to open.

The housing of traveling nut type actuators shall be fitted with a removable cover that shall permit inspection and maintenance of the operating mechanism without removing the actuator from the

valve. Travel limiting devices shall be provided inside the actuator for the open and closed positions. Travel limiting stop nuts or collars installed on the reach rod of traveling-nut type operating mechanisms shall be field adjustable and shall be locked in position by means of a removable roll pin, cotter pin, or other positive locking device. The use of stop nuts or adjustable shaft collars which rely on clamping force or setscrews to prevent rotation of the nut or collar on the reach rod will not be acceptable.

Each actuator shall be designed so that shaft seal leakage cannot enter the actuator housing.

Valves for throttling service shall be equipped with an infinitely variable locking device or a totally enclosed gear actuator.

Actuators shall produce the required torque with a maximum pull of 80 lbs on the lever, hand wheel, or chain. Actuator components shall withstand, without damage, a pull of 200 lbs on the hand wheel or chain wheel or an input of 300 foot-lbs on the operating nut.

- B. Hand Wheels: Hand wheel diameters shall be at least 8 inches but not more than 24 inches for 30 inch and smaller valves and not more than 30 inches for 36 inch and larger valves.
- C. Chain Wheels: Unless otherwise specified in the valve schedules, all valves with center lines more than 7'-6" above the floor shall be provided with chain wheels and operating chains. Each chain wheel operated valve shall be equipped with a chain guide that will permit rapid handling of the operating chain without "gagging" of the wheel and will permit reasonable side pull on the chain. Suitable extensions shall be provided, if necessary, to prevent interference of the chain with adjacent piping or equipment. Operating chains shall be hot-dip galvanized or zinc plated carbon steel and shall be looped to extend to within 4 feet of the floor below the valve.
- D. Levers: Levers shall be capable of being locked in at least five intermediate positions between fully open and fully closed. In any building or structure containing lever operated valves, at least two operating levers shall be provided for each size and type of lever-operated valve.
- E. Chain Levers: Suitable actuator extensions shall be provided, if necessary, to prevent interference of the chain with adjacent piping or equipment. Operating chains shall be hot-dip galvanized carbon steel and shall be looped to extend to within 4 feet of the floor below the valve.
- F. Wrench Nuts: Unless otherwise specified in the valve schedules or on the drawings, wrench nuts shall be provided on all buried valves and on all valves that are to be operated through floor boxes. Unless otherwise directed by Owner, all wrench nuts shall comply with Section 4.4.13 of AWWA C500. At least two operating keys shall be furnished for operation of the wrench nut operated valves.

2.4 ACTUATOR ACCESSORIES

- A. Extension Stems: Extension stems and stem guides shall be furnished when indicated in the respective valve schedules, indicated on the drawings, or otherwise required for proper valve operation. Extension stems shall be of solid steel and shall not be smaller in diameter than the stem of the actuator shaft. Extension stems shall be connected to the actuator with a single Lovejoy "Type D" universal joint with grease-filled protective boot. All stem connections shall be pinned. At least two stem guides shall be furnished with each extension stem, except for buried valves. Stem guides shall be of cast iron, bronze bushed, and adjustable in two directions. Stem guide spacing shall not exceed 100 times the stem diameter or 10 feet, whichever is smaller.

The top stem guide shall be designed to carry the weight of the extension stem. The extension stem shall be provided with a collar pinned to the stem and bearing against the stem thrust guide. Extension stems for chemical resistant butterfly valves located in drainage sumps shall be the two-piece type with stainless steel stem, PVC housing, wall support, and collar. Unless otherwise indicated on the drawings, the length of the stem extension shall be as necessary to position the valve operator 12 inches above the maximum liquid level in the immediate area. Extension stems for buried valve actuators shall extend to within 6 inches of the ground surface, shall be centered in the valve box using spacers, and shall be equipped with a wrench nut. Extension stems for buried valve actuators shall be provided with position indicators as specified in the valve schedules.

- B. Position Indicators: Unless otherwise specified, each valve actuator shall be provided with a position indicator to display the position of the plug or disc relative to the body seat opening. For quarter turn plug, ball, or cone type valves installed in interior locations, the indicating pointer shall be mounted on the outer end of the valve operating shaft extension and shall operate over an indicating scale on the operating mechanism cover. Where the shaft passes through the cover, a suitable stuffing box or other seal shall be provided to prevent the entrance of water. Each actuator for butterfly valves, except where located in manholes, buried, or submerged, shall have a valve disc position indicator mounted on the end of the valve shaft. A disc position indicator shall also be provided on each operating stand or the actuator mounted thereon.
 - 1. Position Indicators for Buried Actuators: When specified in the respective valve schedules, each buried valve actuator shall be equipped with a position indicator. Position indicators shall be Indico "Model 179 Valve Position Indicators" manufactured by the Mills Engineering Company, Needham Heights, Massachusetts, or "Diviner" ground level position indicator manufactured by the Henry Pratt Company, Aurora, Illinois. Each indicator assembly shall be designed for installation on the extension stem connected to the operating stem of the buried actuator mechanism and shall be mounted in the top section of the valve box beneath the valve box cover. Each indicator shall be equipped with a wrench nut. Internal gearing shall be sealed and protected from the elements.

2.5 SHOP PAINTING

- A. All ferrous metal surfaces, except bearing and finished surfaces and stainless steel components of valve actuators and accessories, shall be shop painted for corrosion protection. The valve manufacturer's standard coating will be acceptable, provided it is functionally equivalent to the specified coating and is compatible with the specified field painting.
 - 1. The following surfaces shall be painted:
 - Polished or Machined Surfaces - Rust-preventive compound.
 - Other Surfaces - Epoxy enamel.
 - Actuators and Accessories- Universal primer.

PART 3 - EXECUTION

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3.1 INSTALLATION

- A. Actuators will be installed on the valves in accordance with the Valve Installation Section.

END OF SECTION 15180

SECTION 15250 – MECHANICAL INSULATION

PART 1 - GENERAL

1.1. SCOPE

- A. This section covers the furnishing and installation of insulation, jackets, and accessories for the piping mechanical systems.
- B. Building insulation materials are specified in other sections. Insulation for mechanical equipment which is to be applied at the factory prior to shipment is specified in the individual equipment sections.

1.2 GENERAL

- A. Materials furnished and installed under this section shall be in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by OWNER'S REPRESENTATIVE.
- B. Coordination: CONTRACTOR shall be responsible for coordinating the installation of insulation with the installation of the items or systems to be insulated. Each item or system shall be tested and accepted by OWNER'S REPRESENTATIVE before installation of the insulation materials. CONTRACTOR shall verify that each component of the insulation systems is compatible with all other parts of the system; that all insulation materials are appropriate for the intended applications; and that all necessary devices and accessories have been provided. All insulation of the same class shall be the product of a single manufacturer; however, all the insulation types need not be the products of one manufacturer.
- C. General Equipment Requirements: Specification Section 01610 - General Equipment Requirements shall apply to all equipment and materials provided under this Section.
- D. Governing Standards: Except as modified or supplemented herein, all work covered by this section shall be performed in accordance with all applicable municipal codes and ordinances, laws, and regulations. In case of a conflict between this section and any state law or local ordinance, the latter shall govern. All work shall comply with UL, NFPA, and ASTM safety requirements.
- E. Metal Thickness: Metal thickness and gages specified herein are minimum requirements. Gages refer to US Standard gage.
- F. Surface Burning Characteristics: Insulation, jackets, tapes, and adhesives to be used indoors shall have a composite flame spread rating not to exceed 25 and a composite smoke developed rating of 50 when tested by UL 723, NFPA 255, or ASTM E84. All testing shall be done on materials of the same densities and installed thicknesses as the materials being installed. Insulation materials which have been treated with a flame retardant additive to meet the required flame spread and smoke developed ratings are not acceptable.
- G. Painting and Identification: Field painting and identification shall be as specified in the

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Protective Coatings Section 09940.

1.3 SUBMITTALS

- A. Drawings and Data: A complete list of materials and catalog cuts, together with detailed specifications, materials performance data, installation instructions, parts, devices, and accessories furnished, shall be submitted in accordance with the submittals section. Information shall include certified test results to show compliance with UL, NFPA, and ASTM safety requirements.

1.4 QUALITY ASSURANCE

- A. Manufacturer Experience: A manufacturer shall have furnished material of the type specified which has been in successful operation for not less than the past 5 years.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Shipping, handling and storage shall be in accordance with Specification Section 01612.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Acceptable manufacturers shall be as listed in the respective product description paragraphs.

2.2 MATERIALS

A. Pipe Insulation

1. Type PMF1 Insulation. Type PMF1 mineral fiber pipe insulation shall be Johns Manville "Micro-Lok", Knauf "Pipe Insulation" or Owens-Corning. Type PMF1 pipe insulation shall be a one-piece molded glass fiber material with all-purpose jacket. The all-purpose jacket shall be factory-applied, fiberglass reinforced vapor barrier type, with white Kraft bonded to aluminum foil and self sealing adhesive lap. The insulation shall be suitable for a temperature range of 0°F to 850°F, shall have a maximum thermal conductivity (k) of 0.24 Btu in/hr ft² °F at 75°F, and shall conform to ASTM C547.
2. Type PFC1 Insulation. Type PFC1 flexible cellular elastomeric-pipe insulation shall be Armacell "AP/Armaflex" or Nomaco K-Flex "Insul-Tube 180" for unslit insulation and Armacell "AP/Armaflex SS" or Nomaco K-Flex "InsulLock II" for factory pre-slit insulation. Flexible cellular polyolefin foam insulation shall be IMCOA "Imcolock" or "Imcoshield".

Type PFC1 pipe insulation shall be one-piece, molded elastomeric or polyolefin foam insulation suitable for a temperature range of -40°F to 210°F, and shall have a maximum thermal conductivity (k) of 0.28 Btu in/hr ft² OF at 75°F. The insulation shall be suitable for exposure to weather and direct sunlight or, where not indicated to be jacketed, shall be given two coats of an ultraviolet-resistant finish recommended by the manufacturer. The insulation shall conform to ASTM C534.

2.3 ACCESSORIES

- A. Aluminum Insulation Jackets: Aluminum insulation jackets for insulated piping systems shall be furnished and installed. Fittings in insulated piping systems shall be provided with aluminum jackets of the same aluminum jacketing material as the piping systems. The aluminum jacket shall be Alclad 3004 complying with ASTM B209. The jacket shall have a nominal thickness of 0.024 inches, with an embossed finish. A factory-applied asphalt and Kraft paper vapor barrier or polyethylene film and Kraft paper vapor barrier shall extend the full width of the jacket.
- B. PVC Insulation Jackets. PVC insulation jackets for piping systems shall be furnished and installed as specified herein and indicated on the drawings.

All fittings in piping systems insulated with mineral fiber shall be jacketed with a polyvinyl chloride (PVC) jacketing material. Piping systems where indicated to have PVC jackets shall be jacketed with the same PVC jacketing material. Jackets for fittings shall be one piece, factory molded to the contour of the fitting. The PVC jacket and fitting covers shall have a minimum thickness of 0.020 inches when installed indoors and 0.030 inches when installed outdoors.

PART 3 - EXECUTION

3.1 INSTALLATION.

- A. General. CONTRACTOR shall install all insulation materials as specified herein for the piping systems that are not factory insulated. Insulation materials shall be installed in accordance with the manufacturer's written instructions and recommendations. Surfaces to be insulated shall be cleaned and dried. All work shall be performed within the temperature ranges recommended by the insulation product manufacturer. Insulation shall be kept clean and dry and shall remain in the factory container until it is installed. Packages or factory containers shall bear the manufacturer's stamp or label with the name of the manufacturer and description of materials. Seams of exposed insulation and jackets shall be in the least visible location.

B. Piping Insulation:

- 1. Type PMF1 Insulation: Pipe insulation shall be installed to cover all piping, fittings, and appurtenances. Insulation shall be full length of the factory unit using a single cut piece to complete the run. Abutting cut pieces or scraps shall not be used.

End joints and longitudinal seams shall be tightly butted. Insulation for fittings shall be of the same thickness and conductivity as the adjoining pipe insulation.

Insulated piping conveying fluids at lower than ambient temperatures shall be jacketed with a continuous vapor barrier. The insulation shall be continuous through hangers and penetrations, except at firewall penetrations, and shall be sealed with vapor barrier coating. The vapor barrier coating shall be applied at intervals not exceeding 15 feet for straight runs and not more than 6 inches from fittings. Fibrous insulation laps and butt strips that are not self-sealing shall be secured with adhesive and stapled. Staples and seams shall be coated with vapor barrier material.

On piping 2 inches and larger where the insulation is continuous through the hanger, an insert shall be installed between the support shield and piping. The insert shall be of the same thickness and contour as the adjacent insulation and installed to maintain a continuous vapor barrier through the support. The insert shall be constructed of wood or heavy density insulating material suitable for the system operating temperatures.

2. Type PFC1 Insulation. Pipe insulation shall be installed to cover all pipe, fittings, and appurtenances with all seams and joints sealed by a factory or field applied adhesive. Insulation at fittings and appurtenances shall be carefully formed and fitted. Insulation at elbows shall be mitered using segments of pipe insulation.
- B. PVC Jacketing. PVC jacketing for piping systems shall be installed as specified herein and indicated on the drawings. End joints and longitudinal seams on piping systems conveying fluids at lower than ambient temperatures shall be vapor-sealed, and covered with vapor-barrier tape to ensure a continuous vapor seal. Fittings shall be insulated with glass fiber material.
- C. Aluminum Jacketing. Aluminum jacketing for piping systems shall be installed as specified herein and indicated on the drawings. Jacketing shall be held in place with stainless steel securing bands uniformly spaced at not more than 18 inches to produce tight joints without "bulging". The jacket shall overlap at least 2 inches at longitudinal and circumferential joints. Joints shall be overlapped and sealed with caulk to prevent moisture penetration, and longitudinal joints shall be placed to shed water. Exposed ends of pipe insulation shall be provided with covers constructed of the same material as the jacketing.

Elbows shall be jacketed with spirally wrapped aluminum strips or individual mitered segments or gores cut to fit the insulation.

3.2 INSULATION SCHEDULE

Service	Abbreviation	Size (Inches)	Mechanical Insulation		Notes
			Type	Thickness (Inches)	
PIPING - INDOOR (CONCEALED OR EXPOSED)					
Potable and Non-Potable Hot Water	HW, NPHW	Up to 2	PMF1	1	2
	HW, NPHW	2.5 and Larger	PMF1	1-1/2	2
Potable and Non-Potable Cold Water	CW, NPW	Up to 3	PFC1	3/4	2
	CW, NPW	4 and Larger	PFC1	1	2
Force Main	FW	12 and 16	PMF1	1	1, 3

Notes:

1. Provide aluminum jacket.
2. Provide PVC jacket.

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3. Within wet well, above grating platform.

END OF SECTION 15250

SECTION 15400 - PLUMBING

PART 1 - GENERAL

- 1.1 SCOPE. This section covers the furnishing and installation of materials, appliances, fixtures, equipment, and appurtenances associated with the plumbing systems as specified herein and as indicated on the drawings. Additional requirements for plumbing systems shall be as indicated in the schedules on the Drawings. Suitable connections shall be provided for each fixture, piece of equipment, and appurtenance.

Pipe materials, valves, thermal insulation, and pipe supports which are not an integral part of the fixture or piece of equipment and are not specified herein are covered in other sections.

- 1.2 GENERAL. Equipment furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the drawings, specifications, Engineering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by Owner's Representative.

- A. Coordination. Contractor shall verify that each component of the plumbing system is compatible with all other parts of the system; that all piping, fixtures, and appurtenances are appropriate; and that all devices necessary for a properly functioning system have been provided.

Where two or more units of the same class of equipment are required, they shall be the product of a single manufacturer; however, all the component parts of the system need not be the products of one manufacturer.

Where several manufacturers' names have been listed in this section as possible suppliers, only the products of the first manufacturer listed have been checked for size, functions, and features.

- B. General Equipment Stipulations. The General Equipment Stipulations shall apply to all equipment and materials provided under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.
- C. Governing Standards. Except as modified or supplemented herein, all work covered by this section shall be performed in accordance with all applicable municipal codes and ordinances, laws, and regulations. In case of a conflict between this section and any state law or local ordinance, the latter shall govern.

All work shall conform to the requirements of AGA, ASTM, NFPA, and UL safety requirements.

- D. Power Supply. Unless otherwise specified, power supply to equipment with motors shall be as indicated on the drawings. Power supply for controls shall be 120 volts, 60 Hz, single phase unless otherwise required for a properly operating system.
- E. Metal Thickness. Metal thicknesses and gages specified herein are minimum requirements. Gages refer to US Standard gage.

1.3 MECHANICAL IDENTIFICATION.

- A. Number Plates. All plumbing equipment, piping, and valves denoted on the drawings by a symbol and an identifying number shall be provided with an identifying number plate. The identifying text shall be identical to the symbols indicated herein or on the drawings and shall be located in a conspicuous place. Number plate symbols and numbers shall be capitalized block letters with a minimum height as indicated below.

Item Identified	Letter Height, inches
Major Equipment	3/4
Minor Equipment	1/2

Number plate height shall be twice the letter height. Number plate length shall be as needed, with suitable margins all around. Lettering shall be placed in one row where practicable; however, where required due to excessive length, lettering shall be placed on more than one row and centered.

Number plates shall be in the form of nameplates unless equipment is too small to accommodate the specified nameplate, then tags shall be used. Nameplates and tags shall be metal or plastic. Plastic nameplates and tags shall be laminated phenolic not less than 1/8 inch thick and shall be black with a white core. Metal nameplates and tags shall be at least 12 gage thickness with engraved or imprinted symbols. Tags shall have smooth edges and shall be a minimum diameter of 1-1/2 inches. Tags shall be installed with corrosion-resistant chains or straps. Nameplates shall be installed with corrosion-resistant mechanical fasteners.

- B. Equipment Plates. Plumbing equipment shall be identified with engraved or stamped equipment plates securely affixed to the equipment in an accessible and visible location. Equipment plates shall be in addition to the number plates specified in the preceding paragraph. Equipment plates shall indicate the manufacturer's name, address, product name, catalog number, serial number, capacity, operating and power characteristics, labels of tested compliances, and any other pertinent design data. Equipment plates listing the distributing agent only will not be acceptable.
- C. Piping. Piping identification shall be as specified in the protective coatings section.
- D. Valves. Valves that have been assigned an identification number shall be identified with tags.

1.4 SUBMITTALS.

- A. Drawings and Data. Complete assembly and installation drawings, and wiring and schematic diagrams, together with detailed specifications and data covering materials, parts, devices, and accessories forming a part of the equipment furnished, shall be submitted in accordance with the submittals section. Device tag numbers indicated on the drawings shall be referenced on the wiring and schematic diagrams where applicable. The data and specifications to be submitted for each unit shall include, but shall not be limited to, the following:

Equipment, Piping Accessories, and Appurtenances

Name of manufacturer.

Type and model.

Construction materials, thicknesses, and finishes.

Capacities.

Pressure and temperature ratings.

Overall dimensions.

Piping connection sizes and locations.

Net weight.

Horsepower.

Power requirements.

Wiring diagrams.

Plumbing Fixtures

Name of manufacturer.

Type and model.

Construction materials, thicknesses, and finishes.

Water consumption data.

Overall dimensions.

Rough-in dimensions.

Piping connection sizes and locations.

Net weight.

- B. Operations and Maintenance Data and Manuals. Adequate operation and maintenance information shall be supplied as required in the Submittals section. Operation and maintenance manuals shall be submitted in accordance with the Submittals section.

Operation and maintenance manuals are required for water closets, urinals, faucets and flush valves, emergency fixtures, and water heaters.

1.5 QUALITY ASSURANCE.

- A. Welding Qualifications. All welding procedures and welding operators shall be qualified by an independent testing laboratory in accordance with the applicable provisions of AWS Standard Qualification Procedures. All procedure and operator qualifications shall be in written form and subject to Owner's Representative review. Accurate records of operator and procedure qualifications shall be maintained by Contractor and made available to Owner's Representative upon request.

- B. Qualification. The plumbing system installer shall be licensed as stipulated by the authority having jurisdiction.
- C. Manufacturer's Experience. Unless the equipment manufacturer is specifically named in this section, the manufacturer shall have furnished equipment of the type and size specified which has been in successful operation for not less than the past 5 years.
- D. Construction. Plumbing fixtures shall be constructed in accordance with the following standards:

Stainless Steel	ANSI/ASME A112.19.3M
Faucets	ANSI/NSF 61
Emergency/Safety Fixtures	ANSI Z358.1

- 1.6 DELIVERY, STORAGE, AND HANDLING. Shipping shall be in accordance with the shipping section. Handling and storage shall be in accordance with the Handling and Storage section.
- 1.7 EXTRA MATERIALS. Extra materials shall be furnished for each type and size of plumbing fixture or equipment as required, in the quantities indicated below.

Part	Number Required
Faucet washer cartridge and O-ring kits	1 per 5 fixtures
Water heater relief valves	1 per heater

Extra materials shall be packaged with labels indicating the contents of each package. Each label shall indicate manufacturer's name, equipment name, part nomenclature, part number, address of nearest distributor, and current list price. Extra materials shall be delivered to District as directed.

Extra materials subject to deterioration such as ferrous metal items and electrical components shall be properly protected by lubricants or desiccants and encapsulated in hermetically sealed plastic wrapping.

PART 2 - PRODUCTS

- 2.1 SERVICE CONDITIONS. All plumbing fixtures and equipment shall be designed and selected to meet the specified conditions.
- 2.2 PERFORMANCE AND DESIGN REQUIREMENTS. All fixtures and equipment shall be designed to meet the performance and design conditions specified herein and indicated on the Drawings.
 - A. Dimensional Restrictions. Layout dimensions will vary between manufacturers and the layout area indicated on the drawings is based on typical values. Contractor shall review the contract drawings, the manufacturer's layout drawings, and installation requirements and shall make any modifications required for proper installation subject to acceptance by Owner's Representative.
- 2.3 ACCEPTABLE MANUFACTURERS. Acceptable manufacturers shall be as listed in the

respective product description paragraphs.

2.4 MANUFACTURE AND FABRICATION.

- A. Anchor Bolts and Expansion Anchors. Anchor bolts, expansion anchors, nuts, and washers shall be as indicated in the anchorage in concrete and masonry section unless otherwise indicated on the drawings.
- B. Surface Preparation. All iron and steel surfaces, except motors and speed reducers, shall be shop cleaned by sandblasting or equivalent, in strict conformance with the paint manufacturer's recommendations. All mill scale, rust, and contaminants shall be removed before shop primer is applied.
- C. Shop Painting. All steel and iron surfaces shall be protected by suitable coatings applied in the shop. Surfaces which will be inaccessible after assembly shall be protected for the life of the equipment. Coatings shall be suitable for the environment where the equipment is installed. Exposed surfaces shall be finished, thoroughly cleaned, and filled as necessary to provide a smooth, uniform base for painting. Electric motors, speed reducers, starters, and other self-contained or enclosed components shall be shop primed or finished with an oil-resistant enamel or universal type primer suitable for top coating in the field with a universal primer and aliphatic polyurethane system.

Surfaces to be coated after installation shall be prepared for painting as recommended by the paint manufacturer for the intended service, and then shop painted with one or more coats of the specified primer.

Surface finish damaged during installation shall be repaired to the satisfaction of Owner's Representative. Field painting shall conform to the requirements of the painting section.

- D. Equipment Bases. Unless otherwise indicated or specified, all equipment shall be installed on concrete bases at least 6 inches high.
- E. Special Tools and Accessories. Equipment requiring periodic repair and adjustment shall be furnished complete with all special tools, instruments, and accessories required for proper maintenance. Equipment requiring special devices for lifting or handling shall be furnished complete with those devices.
- F. Piping Systems. Unless otherwise specified herein, piping system materials shall be as specified in other sections.
- G. Valves. Unless otherwise specified herein, valves indicated to be a part of the plumbing systems shall be as specified in other Sections.

2.5 WATER SUPPLY PIPING ACCESSORIES.

- A. Water Hammer Arresters. Water hammer arresters shall be either bellows or piston type. Bellows type arresters shall consist of a stainless steel shell, a factory charged and sealed compression chamber, a stainless steel or elastomer bellows, and a stainless steel threaded adapter. Piston type arresters shall consist of a seamless Type L copper shell, a seamlessly spun and factory charged air chamber, a factory lubricated double or triple O-ring sealed piston, and a threaded copper adapter. Water hammer arresters shall be tested and certified in

accordance with American Society of Sanitary Engineering (ASSE) Standard 1010. Arresters shall be rated for a maximum working pressure of 350 psig and a temperature range of 33°F to 250°F. Water hammer arresters shall be Smith "Hydrotrol", Josam "75000 Series Absorbotron", Wade "Shokstop", or Sioux Chief "Hydra-Rester".

- B. Hose Faucets. Hose faucets shall be constructed with nickel or chrome plated cast brass body, solid brass stem, threaded bonnet, and "T" style handle. Hose faucets shall be provided with a ¾ inch male pipe thread inlet and a ¾ inch male hose thread outlet unless otherwise indicated on the drawings. Hose faucets shall be Prier Brass "Model C-138NP.75" or Dearborn Brass.
- C. Post Hydrants. Post hydrants shall be the freeze proof type, constructed with a bronze body and a cast iron casing guard and "T" style handle. Post hydrants shall be provided with a 1 inch male pipe thread inlet and a 1 inch male hose thread outlet unless otherwise indicated on the Drawings. Post hydrants shall be Smith "Model 5911" or Zurn "Model 1385".

2.6 DRAINAGE AND VENT PIPING ACCESSORIES.

- A. Cleanouts. Cleanouts shall be provided where indicated on the drawings and required by the referenced codes, and shall be of the required type.

Floor cleanouts shall consist of a two piece body, a threaded plug, an adjustable head, and a cover. Cleanouts installed in floors that include a waterproofing membrane shall be provided with a flashing flange and membrane clamp. Cleanouts installed in partition walls shall be provided with an access cover and frame with a securing screw installed over the cleanout plug. Wall cleanout covers shall be stainless steel. Cleanouts installed in exposed piping shall consist of a ferrule or threaded adapter and a cast brass or bronze plug installed in a T-pattern, 90 degree drainage fitting.

Cast iron cleanouts shall be manufactured by Smith, Josam, or Wade. Polypropylene cleanouts shall be manufactured by Orion or Enfield. PVC cleanouts shall be manufactured by Sioux Chief.

- B. Floor Drains. Floor drains shall be of the types specified herein and indicated on the drawings. Floor drains shall have a two-piece body, a flashing collar, an adjustable head, and a grate. A trap primer connection shall be provided when indicated on the drawings. Floor drains installed in floors that include a waterproofing membrane shall be provided with a flashing flange and membrane clamp.

Cast iron floor drains shall be manufactured by Smith, Josam, or Wade. PVC floor drains shall be manufactured by Sioux Chief.

- C. Vent Flashings. Plumbing vent flashings shall be furnished and installed as indicated on the Drawings.

2.7 PLUMBING FIXTURES AND ACCESSORIES.

- A. General. Plumbing fixtures shall be provided with all required supports, fasteners, supply and drain fittings, gaskets, and escutcheons required for a complete installation.
- B. Water Closets. Water closets shall be of vitreous china, with an elongated bowl and siphon jet flushing action. The type and water use of water closets shall be as indicated on the drawings.

All water closets shall be provided with anchor bolt caps. Flush valve type water closets shall be provided with top spud connections for flushometer valves. Water closets shall be manufactured by Kohler, American Standard, or Eljer.

1. Seats. Water closet seats shall be white, solid plastic, contoured, elongated open front type without cover, with concealed check and stainless steel hinges. The seats shall be manufactured by Kohler, American Standard, Eljer, or Church.
 2. Flush Valves. Flush valves for top spud type water closets shall be exposed type, with a chrome plated brass body, an externally adjustable diaphragm, an angle stop, a renewable valve seat, a tailpiece, a vacuum breaker, a wall flange, a spud nut and flange, and a 1 inch NPT water supply connection. Flush valves shall be Sloan "Royal" or Delaney.
 3. Supply Set. A supply set consisting of a 1/2 inch NPT brass angle loose key stop valve, a copper supply tube, and an escutcheon plate shall be furnished for each tank type water closet. All supply components shall be polished chrome.
 4. Chair Carriers. Wall-mounted water closets shall be provided with adjustable chair carriers. The carriers shall be suitable for the chase depth and piping arrangement and shall consist of a heavy-duty cast iron body, complete with a drainage fitting, pylon feet, a drainage nipple, fitting and fixture gaskets, a positioning frame or template, and mounting hardware. Chair carriers shall be manufactured by Smith, Josam, or Wade.
- C. Lavatories. Lavatory types, dimensions, and water use shall be as indicated on the drawings. Lavatories shall be of vitreous china, constructed with overflow drains and soap depressions. Wall-mounted lavatories shall be drilled for a concealed arm carrier. Faucet drillings shall be 4 inches on center unless otherwise indicated. Lavatories shall be manufactured by Kohler, American Standard, or Eljer.
1. Faucets and Trim. Lavatory faucets shall be 4 inches on center, of polished chrome, with a vandal-resistant single-lever handle and all-brass or copper waterways. Each faucet shall be provided with a flow restrictor, a cast brass grid strainer or pop-up drain, and a 1-1/4 inch cast brass tailpiece. Flow restrictors shall limit water flow as required by the applicable codes and standards. Supply sets consisting of 1/2 inch NPT brass angle loose key stop valves, copper supply tubes, and escutcheon plates shall be furnished for each lavatory faucet. All supply components shall be polished chrome. Lavatory supplies shall be insulated. Lavatory faucets and supply sets shall be manufactured by Kohler, American Standard, or Eljer.
 2. Traps. Lavatory traps shall be at least 1-1/4 inches in diameter, cast brass with polished chrome finish, with an escutcheon flange and a cleanout plug. Lavatory traps shall be offset, insulated type.
- Lavatory supplies and traps may be pre-insulated or furnished with an insulation kit for field installation. Insulating material shall be flame retardant closed cell vinyl. The supply insulating kit shall be snap form type or shall be provided with ties. The trap insulation material shall not require the use of ties or mechanical fasteners to be held in place. Pre-insulated traps and supply insulation kits shall be McGuire Products "ProWrap". Trap and supply insulation kits shall be as manufactured by

TRUEBRO Inc.

3. Supports. Wall-hung lavatories shall be provided with a complete fixture support system, including support legs, bearing plates, concealed arms, and anchor bolts. The support legs shall be mounted within the partition wall. For lavatories mounted on masonry walls, support legs may be omitted. Lavatory supports shall be manufactured by Smith, Josam, or Wade.

2.8 PLUMBING EQUIPMENT.

- A. General. Plumbing equipment shall be provided with all supports, fasteners, fittings, and escutcheons required for a complete installation.
- B. Water Heaters and Accessories. Water heaters shall be furnished and installed where indicated on the drawings. Heater type, storage capacity, recovery rate, energy input, power supply requirements, manufacturer, and model shall be as indicated on the Drawings.

1. Electric Tempered Instantaneous Water Heaters. Tempered instantaneous water heaters shall be tankless type and shall heat water on demand. Heaters shall be provided with safeties to prevent scalding. Heaters shall be suitable for operating water pressures of 25 to 150 psig. Heaters shall be flow activated with an on-off switch and flow switch located in the inlet tube. Heater waterways shall be of brass/copper construction. Each heater shall be provided with a temperature and pressure relief valve. Heaters shall be provided with thermostatic control, internal fusing, 100 degree thermal cut off fuses, and digital temperature control. Provide LED controller with dual display of set point and actual temperature with set point temperature locked out to a specified range. Provide fully modulating PID temperature control with a +/- 1°F accuracy on regulated pressure, integral disconnect, ground-fault protection and NEMA 4 enclosures.

- 2.9 ELECTRICAL. Electrical controls and disconnects shall be furnished and installed as per Specification Section 16050, except where specified herein. All electrical controls shall have enclosures suitable for the environment and NEMA rating as indicated on the electrical drawings.

PART 3 - EXECUTION

- 3.1 INSPECTION. Equipment installed in existing facilities with limited access shall be suitable for being installed through available openings. Contractor shall field verify existing opening dimensions and other provisions for installation prior to submittal of bids.

3.2 PREPARATION.

- A. Surface Preparation. All surfaces to be field painted shall be dry and free of dirt, dust, sand, grit mud, oil, grease, rust, loose mill scale, or other objectionable substances, and shall meet the recommendations of the paint manufacturer for surface preparation. Cleaning and painting operations shall be performed in a manner which will prevent dust or other contaminants from getting on freshly painted surfaces. Oil and grease shall be completely removed by use of solvents or detergents before mechanical cleaning is started. The gloss of previously painted

surfaces shall be dulled if necessary for proper adhesion of top coats.

- 3.3 INSTALLATION. Materials furnished under this section shall be installed in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Owner's Representative.

Unless otherwise indicated, sleeves shall be provided for all pipe penetrations through concrete and masonry walls. Sleeves and sealing requirements shall be as indicated in the miscellaneous piping and accessories installation section and as indicated on the drawings.

Not all required reducing fittings and unions are indicated. Additional fittings and unions shall be provided as needed to connect all equipment and appurtenances.

Insulating fittings shall be provided to prevent the contact of dissimilar metals in piping systems.

Piping shall not be routed over or in front of electrical switchboards or panels unless acceptable to Owner's Representative.

- A. Water Supply Piping and Accessories. Water hammer arresters shall be provided in the hot and cold water supply piping at all quick closing valves, at solenoid valves, and at plumbing fixtures. When not indicated on the drawings, arresters shall be located and sized by Contractor in accordance with PDI Standard No. WH201. Contractor shall submit arrester location and sizing plans to Owner's Representative for approval prior to installation. Where possible, water hammer arresters shall be installed in an accessible location.

Water supply piping to hose faucets shall be secured with a pipe support within 6 inches of the fixture.

- B. Drainage and Vent Piping and Accessories. Unless otherwise indicated or required by code, horizontal sanitary drainage piping 3 inches in diameter or smaller shall be installed at a uniform slope of 1/4 inch per foot; horizontal sanitary drainage piping larger than 3 inches in diameter shall be installed at a uniform slope of 1/8 inch per foot; horizontal storm drainage piping shall be installed at a uniform slope of 1/8 inch per foot.

Drainage fittings shall be installed to convey flow in the piping in the intended direction. To the extent possible, changes in direction shall be made by sweep type fittings. Quarter-bends and sanitary tee fittings shall not be installed for vertical to horizontal or horizontal to horizontal changes of direction.

Plumbing vents through roofs shall be located at least 12 inches from a parapet or from the intersection of a cant with the roof deck, and shall be installed with watertight flashings. Plumbing vents shall be located no closer to operable windows or air intakes than is allowed by the applicable code.

Vents connecting to horizontal sanitary piping shall connect above the centerline of the piping and shall rise at an angle of not less than 45 degrees from the horizontal to a point at least 6 inches above the flood level rim of the fixture served before offsetting horizontally.

Floor drains shall be adjusted to the correct elevation for proper drainage. Heads of fastening

screws shall be flush with the grate surface.

Cleanouts on drainage piping inside structures shall be located where indicated on the drawings. Additional cleanouts shall be provided where required by the applicable code or authority having jurisdiction. Cleanouts located in drainage risers shall be located 12 inches above the finished floor.

Unless otherwise indicated or required by the applicable code, cleanout size shall equal the line size for 4 inch and smaller drainage piping, and 4 inches in diameter for drains larger than 4 inch. Proper clearance shall be provided for access to cleanouts. Floor cleanouts shall be installed flush with the finished floor.

Floor drains, trench drains, floor sinks, funnel receptors, and bell-up drains indicated to be equipped with traps shall be provided with deep seal "P" traps located as close to the drain as possible.

- C. Plumbing Fixtures and Accessories. Plumbing fixtures shall be set level and plumb, and shall be securely attached to the floor or wall. Unless otherwise indicated on the drawings, each fixture shall be mounted at the height recommended by the manufacturer. Where required to be in compliance with ADA, fixtures shall be mounted at the heights established by the Federal Government.

Fixtures shall be sealed to the floor or wall with a sealant as specified in the caulking section. The color of sealant shall match the color of the fixture.

Fixture traps shall be easily removable for servicing and cleaning. Escutcheons shall be placed at all locations where fixture supply or drain piping penetrates walls, floors, or ceilings.

Water piping at stop valves, shower heads, and flush valves shall be rigidly secured to blocking. Drop-ear elbows shall be used whenever possible.

All water supply piping shall be cleaned and flushed before the plumbing fixtures are installed.

- D. Plumbing Equipment. Plumbing equipment shall be installed in accordance with the manufacturer's recommendations. Adequate clearance shall be provided for access to all components which may require adjustment, servicing, or replacement.

Water heaters shall be installed in accordance with AGA, NSF, NFPA, and UL requirements. Storage type water heaters shall be cleaned and flushed before being connected to the potable water system. Water heater relief valves shall be piped to the nearest drain or as indicated on the drawings, and shall terminate the appropriate air gap distance above the drain. Unless otherwise indicated, water heater thermostats shall be set such that the maximum water temperature does not exceed 140°F.

3.4 FIELD QUALITY CONTROL.

- A. Installation Check. An installation check by an authorized representative of the manufacturer of equipment specified herein is not required.
- B. Startup and Testing. Field performance tests shall be conducted to demonstrate that each system is functioning as specified and to the satisfaction of Owner's Representative.

If inspection or tests indicate defects, the defective work or material shall be replaced, and inspection and tests repeated. All repairs to piping shall be made with new materials. Caulking of threaded joints or holes will not be acceptable.

- 3.5 ADJUSTING. All devices shall be adjusted for proper flow and quiet operation.

Faucet and supply assemblies shall be adjusted or repaired to eliminate leaks. All drains shall be checked for proper operation.

- 3.6 PROTECTION. Plumbing fixtures, equipment and appurtenances shall be protected from damage immediately after installation. Plumbing fixtures shall not be used during the construction.

- 3.7 CLEANING. After completion of testing and immediately before the final inspection, plumbing fixtures, equipment, piping, and appurtenances shall be thoroughly cleaned. Cleaning materials and methods shall be as recommended by the manufacturer. All faucet aerators shall be removed, cleaned, and reinserted.

Any stoppage, discoloration, or other damage to parts of the building, its finish, or furnishings shall be repaired at no additional cost to District.

- 3.8 DISINFECTION. Before the potable water system is placed in operation, it shall be disinfected in accordance with the requirements of the local authority having jurisdiction. In the absence of local requirements, the following disinfection method shall be used:

- A. The system shall be purged with clean potable water until all dirt and other substances are flushed from the system.
- B. The system shall be filled with a water/chlorine solution containing at least 50 parts per million of available chlorine and allowed to stand for 24 hours; or the system shall be filled with a water/chlorine solution containing at least 200 parts per million of available chlorine and allowed to stand for 3 hours.
- C. The system shall be purged with clean potable water until the chlorine is flushed from the system.
- D. The procedure shall be repeated if a bacterial examination indicates that contamination remains present in the system.

END OF SECTION 15400

SECTION 15500 - HEATING, VENTILATING, AND AIR CONDITIONING

PART 1 - GENERAL

- 1.1 SCOPE. This section covers the furnishing and installation of heating, ventilating, and air conditioning (HVAC) equipment, devices, and appurtenances associated with the HVAC systems.

Piping, pipe supports, valves, and accessories which are not an integral part of the equipment or are not specified herein are covered in other sections.

- 1.2 GENERAL. Equipment furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the drawings, specifications, data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by Owner's Representative.

- A. Coordination. Contractor shall verify that each component of the system is compatible with all other parts of the system; that all piping, ductwork, materials, fans, and motor sizes are appropriate; and that all devices necessary for a properly functioning system have been provided.

Where two or more units of the same class of equipment are needed, they shall be the product of a single manufacturer; however, all the component parts of the system need not be the products of one manufacturer.

Where individual equipment paragraphs specify the requirement for local service, each manufacturer shall have a local service center, or with written consent of Owner's Representative, shall be able to provide service from other locations within 24 hours. The service center shall be equipped and staffed to service the system and shall maintain a local parts supply. Information on equipment manufacturers' representatives shall be included with the submittals.

Where several manufacturers' names have been listed in this section as possible suppliers, only the products of the first manufacturer listed have been checked for size, functions, and features.

- B. Governing Standards. Except as modified or supplemented herein, all work covered by this section shall be performed in accordance with all applicable municipal codes and ordinances, laws, and regulations. In case of a conflict between this section and any state law or local ordinance, the latter shall govern.

All work shall comply with UL safety requirements.

- C. Power Supply. Power supply to equipment with motors shall be as indicated in schedules on the Drawings. Power supply for controls shall be 120 volts, 60 Hz, single phase unless otherwise required for a properly operating system.
- D. Metal Thickness. Metal thickness and gages specified herein are minimum requirements. Gages refer to US Standard gage.

- E. Mechanical Identification. Mechanical identification shall conform to the requirements of the Basic Mechanical Building Systems Materials and Methods section.

1.3 SUBMITTALS.

- A. Drawings and Data. Complete assembly and installation drawings, and wiring and schematic diagrams, together with detailed specifications and data covering materials, parts, devices, and accessories forming a part of the equipment furnished, shall be submitted in accordance with the Submittals section. Device tag numbers indicated on the drawings shall be referenced on the wiring and schematic diagrams where applicable. The data and specifications for each unit shall include, but shall not be limited to, the following:

Fans

Name of manufacturer.

Type and model.

Construction materials, thickness, and finishes.

Overall dimensions and required clearances.

Net weight and load distribution.

Performance curves with the specified operating point clearly identified for each unit, type, and model, with capacity in cubic feet per minute as the abscissa and brake horsepower, static pressure, and efficiency as the ordinate. The fan curves shall include a family of curves for at least 3 different rotative speeds on a single chart.

Certified AMCA standard test code sound power output data for the fan outlet and casing when operating at the specified volume flow rate. Sound data shall list dB re 10-12 watts in each octave band, with midrange frequencies starting at 63 Hz and ending at 8,000 Hz.

Where specified, information on equipment manufacturers' representatives.

Equipment (not specifically listed)

Name of manufacturer.

Type and model.

Construction materials, thickness, and finishes.

Manufacturer's performance data.

Overall dimensions and required clearances.

Net weight and load distribution.

Wiring diagrams.

Temperature Controls

Published descriptive data on each item of equipment and accessories, indicating all specific characteristics and options and identified with the designation used herein and on the drawings.

Schematic control diagrams giving specific data on all settings, ranges, actions, adjustments, and normal positions. Although schematic, these diagrams shall, as closely as possible, represent the actual system with all significant equipment and devices identified and located relative to each other. These diagrams shall also show detailed multiline wiring with all terminals accurately identified. The wiring diagrams shall show the internal connections of the temperature control panels and all field wiring to equipment remote from the control panels, including wiring to Owner-furnished equipment. The wiring diagrams shall be complete, showing all connections necessary to place the temperature control systems in operation. Wiring diagrams shall be detailed to the degree necessary for field construction and shall include all related wiring. Sequence of operation for each system corresponding to the control schematics.

Space thermostat schedule indicating the types of covers and means of adjustment for each space.

Conduit and wire types.

Where specified, information on equipment manufacturers' representatives.

- B. Operation and Maintenance Data and Manuals. Adequate operation and maintenance information shall be supplied as required in the Submittals section. Operation and maintenance manuals shall be submitted in accordance with the Submittals section. The operation and maintenance manuals shall be in addition to any instructions or parts lists packed with or attached to the equipment when delivered.

In addition to the requirements of the Submittals section, the operation and maintenance manuals shall include a listing of all filter locations, types, sizes, and quantities associated with each piece of equipment.

- 1.5 DELIVERY, STORAGE, AND HANDLING. Delivery, storage, and handling shall be in accordance with Specification Section 01612.
- 1.6 EXTRA MATERIALS. Extra materials shall be furnished for the equipment as specified in the individual equipment paragraphs. Extra materials shall be packaged in accordance with the Delivery, Storage, and Handling section, with labels indicating the contents of each package. Each label shall indicate manufacturer's name, equipment name, equipment designation, part nomenclature, part number, address of nearest distributor, and current list price. Extra materials shall be delivered to Owner as directed. Extra materials subject to deterioration such as ferrous metal items and electrical components shall be properly protected by lubricants or desiccants and encapsulated in hermetically sealed plastic wrapping.
- 1.7 ELECTRICAL COMPONENTS. All electrical, motors, control panels and control devices shall conform to Division 13 and 16 specifications.

PART 2 - PRODUCTS

2.1 SERVICE CONDITIONS. All equipment shall be designed and selected to meet the specified conditions.

2.2 PERFORMANCE AND DESIGN REQUIREMENTS. Equipment capacities shall be as indicated on the schedules. Where equipment is provided with protective coatings, unit capacities shall be corrected to account for any efficiency losses from the selected protective coating.

Each fan's operating selection point on the fan curves shall be selected to the right of the peak pressure/efficiency point and below the lowest point along the fan curve to the left of the peak pressure/efficiency point.

A. Dimensional Restrictions. Layout dimensions will vary between manufacturers and the layout area indicated on the drawings is based on typical values of the first manufacturer listed. Contractor shall review the contract drawings, the manufacturer's layout drawings, and installation requirements and shall make any modifications required for proper installation subject to acceptance by Owner's Representative. At least 3 feet of clear access space shall be provided on all sides of the unit unless otherwise indicated.

B. Elevation. Equipment shall be designed to operate at the elevation as indicated on the Drawings.

2.3 ACCEPTABLE MANUFACTURERS. Acceptable manufacturers shall be as listed in the respective product description paragraphs.

2.4 MATERIALS.

A. Heaters. Heaters of the types, sizes, and capacities specified herein shall be furnished and installed where indicated on the drawings. All heaters shall be complete with controls and accessories required for satisfactory operation. Heaters shall be UL listed unless otherwise indicated.

Wall Heaters. Wall heaters, denoted by the symbol "WH" and an identifying number, shall be manufactured by Electromode "Model EWA", or Brasch.

Wall heaters shall be downflow type; designed for mounting as indicated on the drawings; and shall include an electric heating element, a thermal limit switch, a fan delay switch, a fan and motor assembly, and a built-in thermostat. The heaters shall be suitable for use with the specified power supply and shall have the capacity indicated in the schedules on the drawings.

B. Mini-Split Systems.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

Mitsubishi Electronics America, Inc.; HVAC Division.

LG Air Conditioning Technologies.

2. Wall Surface Evaporator-Fan Components

Chassis: High-strength molded plastic, removable panels for servicing.

Drain Pans: Polycarbonate plastic, with connection for drain; insulated.

Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

Fan: Direct drive centrifugal; double inlet, forward curve.

Special Motor Features: Multitapped, multispeed with internal thermal protection and permanent lubrication.

Permanent, Cleanable Filters: 1/2-inch-(25-mm-) thick plastic screen.

Wiring Terminations: Connect motor to chassis wiring with plug connection.

Condensate Pump: Integral with unit.

3. Air-Cooled, Compressor-Condenser Components

Casing: Galvanized steel, finished with baked enamel, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.

Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

Compressor Type: Scroll.

Inverter controlled compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.

Refrigerant: R-410A.

Refrigerant Coil: Copper tube with mechanically bonded aluminum fins complying with ARI 210/240, and with liquid subcooler.

Fan: Polycarbonate plastic-propeller type directly connected to motor.

Motor: Permanently lubricated with integral thermal-overload protection.

4 Accessories

Low ambient operation control kit: Permits operation down to 0 Deg F.

Roof equipment rails (for condensing unit) galvanized steel, 12 inches tall with built-in cant strip and encased wooden mounting strip.

Sensor: Hard wired, 12V DC functioning to remotely control compressor and evaporator fan with the following features:

Compressor time delay.

24-hour time control of system stop and start.

Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.

Fan-speed selection, including auto setting.

Automatic-reset timer to prevent rapid cycling of compressor.

Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction and liquid line with flared fittings at both ends.

Minimum Insulation Thickness: 1/2 inch (13 mm).

Fresh Air Intake Kits: Accessory collars and baffles to permit introduction of fresh air into unit housing.

Control adapter to allow unit to enable/disable through the Building Automation System.

- 2.5 ELECTRICAL. Motor starters and controls shall be furnished and installed under the Division 16, Section 16050, Electrical, except for equipment specified or furnished with prewired integral starters. Disconnects for equipment shall be furnished and installed under the Section 16050, Electrical, except where specified with integral disconnects. All electrical controls shall have enclosures suitable for the environment and NEMA rating as indicated on the Electrical Drawings. Equipment installed outdoors shall have NEMA Type 4 enclosures. All electrical components supplied with equipment or system shall meet the requirements of the applicable Division 16.
- 2.6 MANUFACTURE AND FABRICATION. Manufacture and fabrication shall comply with the requirements of the Basic Mechanical Systems Materials and Methods section.
- 2.7 SHOP TESTING. The equipment furnished under this section shall be tested at the factory according to the standard practice of the manufacturer. Ratings shall be based on tests made in accordance with applicable AMCA, ASHRAE, ARI, NBS, NFPA, and UL Standards.
- 2.8 BALANCE. All rotating parts shall be accurately machined and shall be in as nearly perfect rotational balance as practicable. Excessive vibration shall be sufficient cause for rejection of the equipment. The mass of the unit and its distribution shall be such that the resonance at normal operating speeds is avoided. In any case, the maximum measured root-mean-square (rms) value as measured at any point on the equipment shall not exceed those listed in the latest ASHRAE Applications Handbook: At any operating speed, the ratio of rotative speed to the

critical speed of a unit or components thereof shall be less than 0.8 or more than 1.3.

PART 3 - EXECUTION

- 3.1 INSPECTION. Equipment installed in facilities with limited access shall be suitable for being installed through available openings. Contractor shall field verify existing opening dimensions and other provisions for installation prior to submittal of bids.

Where penetrations through existing concrete slabs are made, the Contractor shall locate and avoid damage to all rebar, embedded conduit, etc. when making new openings.

3.2 PREPARATION.

- A. Field Measurement. Contractor shall be responsible for verifying all field dimensions, and for verifying location of all equipment relative to any existing equipment or structures.
- B. Surface Preparation. All surfaces to be field painted shall be dry and free of dirt, dust, sand, grit, mud, oil, grease, rust, loose mill scale, or other 'objectionable substances, and shall meet the recommendations of the paint manufacturer for surface preparation. Cleaning and painting operations shall be performed in a manner that will protect freshly painted surfaces from dust or other contaminants. Oil and grease shall be completely removed by use of solvents or detergents before mechanical cleaning is started. The gloss of previously painted surfaces shall be dulled if necessary for proper adhesion of top coats.

Surface finish damaged during installation shall be repaired to the satisfaction of Owner's Representative. Field painting shall be as specified in the architectural painting and Protective Coatings sections.

- 3.3 INSTALLATION. Equipment and materials furnished under this section shall be installed in proper operating condition in full conformity with the drawings, specifications, data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Owner's Representative.

- A. Heaters. The bottom elevation of unit heaters shall be 8 feet above finished floor unless otherwise indicated. Electric duct heaters shall be installed with a minimum distance of 4 feet from all ductwork transitions and obstructions on both sides of the heater.

3.4 FIELD QUALITY CONTROL.

- A. Installation Check. An installation check by an authorized representative of the manufacturer is not required for equipment specified in this section.
- B. Startup and Testing. After the equipment and systems have been installed, adjusted, and balanced, tests shall be conducted to demonstrate that each system is functioning as specified and to the satisfaction of Owner's Representative. Tests shall be as indicated in the Equipment and System Performance and Operational Testing section.

If inspection or tests indicate defects, the defective work or material shall be replaced, and inspection and tests repeated. All repairs to piping shall be made with new materials. Caulking

of threaded joints or holes will not be acceptable.

- 3.5 CLEANING. At the completion of the testing, all equipment, pipes, ductwork, valves, and fittings shall be cleaned of grease, debris, metal cuttings, and sludge. Any stoppage, discoloration, or other damage to parts of the building, its finish, or furnishings shall be repaired by Contractor at no additional cost to Owner.

END OF SECTION 15500

NEW YORK STATE THRUWAY AUTHORITY
NIAGARA PUMP HOUSE UPGRADE

C&S #185.026.004

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ELECTRICAL

1. DESCRIPTION:

- 1.01 Furnish all labor, materials, equipment and services necessary to complete the work as indicated on the Contract Plans and the attached Specification Summary.
- 1.02 All work shall conform to the requirements specified in Part 1 – General, of the Sections listed.

2. MATERIALS:

- 2.01 The materials shall be as specified in Part 2 – Products, of the Sections listed.

3. CONSTRUCTION DETAILS:

- 3.01 The construction details shall be as specified on Part 3 – Execution, if the Sections listed.

4. METHOD OF MEASUREMENT:

- 4.01 This item shall be measured for payment on a lump sum basis for the work completed in accordance with the Contract Documents and as directed by the Engineer.

5. BASIS OF PAYMENT:

- 5.01 Payment for this item shall be made at the lump sum bid price bid. The lump sum price bid shall include cost of furnishing all labor, material, equipment and appliances necessary to complete the work as indicated on the Contract Plans and as specified herein in the Sections listed.
- 5.02 Detailed Estimate:
 - A. Before the first certificate of payment is issued for the work under this item, submit a detailed estimate of quantities and prices for all materials, labor, and other items included under this item, which shall aggregate the contract lump sum price bid for this item. Prepare the detailed estimate in the same sequence as the Sections listed.
 - B. The detailed estimate shall be supported by such evidence, including certified copies of subcontracts, as the Engineer may require.
 - C. The detailed estimate must be approved by the Engineer who may revise it as, in his/her reasonable judgment, is necessary to make the various item conform to their true values. The value of each certificate of payment will be based on the approved detailed estimate.
- 5.03 Monthly payments will be made for this item in proportion to the total amount of work completed.

NEW YORK STATE THRUWAY AUTHORITY
NIAGARA PUMP HOUSE UPGRADE

C&S #185.026.004

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ELECTRICAL

1. SPECIFICATION SUMMARY

1.01 This Item includes the following specifications:

- A. Section 16050 Electrical
- B. Section 16160 Adjustable Frequency Drives
- C. Section 16480 600 Volt Class Motor Control Centers
- D. Section 16721 Fire Alarm and Detection System
- E. Section 16725 Electronic Security Equipment

1.02 This item shall include, but not be limited to, the following:

- A. Electrical controls, alarms, and other such components necessary for the pumphouse upgrade.

SECTION 16050 - ELECTRICAL

PART 1 - GENERAL

- 1.1 SCOPE. This section covers the furnishing and installation of all equipment and materials needed for the electrical requirements of this Contract.

This Section covers the installation and interconnection of electrical equipment furnished under other Specification Sections, except electrical items designated to be installed under those Sections.

- 1.2 GENERAL. Electrical apparatus on all equipment shall be installed complete and placed in readiness for proper operation.

Electrical materials furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the Drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Owner's Representative.

- A. General Equipment Requirements. The General Equipment Requirements Section 01610 shall apply to all equipment provided under this Section if requirements in this specification differ from those in the General Equipment Requirements Section 01610, the requirements specified herein shall take precedence.
 - B. Coordination. Electrical work shall conform to the construction schedule and the progress of other trades.
 - C. Anchor Bolts and Expansion Anchors. All anchor bolts, nuts, washers, and expansion anchors shall comply with Section 05550, Anchorage in Concrete and Masonry, except smaller than 3/4 inch will be permitted to match NEMA standard size bolt holes on motors and electrical equipment.
 - D. Drawings. Supplementing this Section, the Drawings indicate locations of equipment and enclosures and provide one-line and schematic diagrams regarding the connection and interaction with other equipment.
- 1.3 Codes. All work shall be performed and materials shall be furnished in accordance with the NEC - National Electrical Code, the NESC - National Electrical Safety Code and the following standards where applicable:

ANSI - American National Standards Institute.

ASTM - American Society for Testing and Materials.

AWG - American Wire Gauge.

Fed Spec - Federal Specification.

ICEA - Insulated Cable Engineers Association.

IEEE - Institute of Electrical and Electronics Engineers.

IESNA - Illuminating Engineering Society of North America.

NEIS - National Electrical Installation Standards.

NEMA - National Electrical Manufacturers Association.

NFPA - National Fire Protection Association.

UL - Underwriters' Laboratories.

Equipment covered by this section shall be listed by UL, or by a nationally recognized third party testing laboratory. All costs associated with obtaining the listing shall be the responsibility of Contractor. If no third-party testing laboratory provides the required listing, an independent test shall be performed at Contractor's expense. Before the test is conducted, Contractor shall submit a copy of the testing procedure to be used.

1.4 IDENTIFICATION.

- A. Conduit. Conduits in manholes, hand holes, building entrance pull boxes, junction boxes, and at equipment shall be provided with identification tags. Identification tags shall be 19 gage stainless steel, with 1/2 inch stamped letters and numbers as indicated on the Drawings. Identification tags shall be attached to conduits with nylon tie wraps and shall be positioned to be readily visible. Identification tags shall display circuit identification as indicated on one line diagrams.

All spare, unused, and abandoned conduits shall be labeled with the destination (MCC's, Switchboards, Power Panels, Switchgear, Control Panels, manhole/handhole No., etc).

- B. Conductors. All conductors in power, control, indication, lighting, receptacle, and instrumentation circuits shall be provided with identification labels at both ends and at any splices or junctions. Each conductor shall have the same identification label at all points. In addition, instrumentation circuits shall be identified and color coded as described herein.

- 1. Conductor Identification Labels. Conductor identification labels shall be machine printed with Brady "TLS 2200" label machine. Labels shall be "PSPT-XXX-1W" (1.01 inch wide) or "PSPT-XXX-175W" (1.76 inch wide) as required for the number of characters. Exact labeling shall be coordinated with the Owner's Representative but shall be no smaller than 10 point.

For instrumentation, control, and indication circuits the label shall include two (2) lines of text. Line 1 of the text identification shall list the circuit identification and the device/panel from which the power or signal is coming, including the terminal strip number, and the terminal number. Line 2 of the text identification shall list the device/panel to which the conductor is connected to including terminal strip number, and terminal number. Both ends of the conductor shall be labeled identically. Exact labeling for all control, instrumentation, and signal conductors shall be coordinated with the Owner's Representative.

The conductor identification labels shall be as indicated on the equipment manufacturer's Drawings.

The conductor identification labels shall be positioned to be readily visible for inspection.

2. Power Conductor Color Coding. Power conductors shall be color coded with marking tape or factory colored insulation. For 120/208 volt, three phase, 4 wire Black/Red/Blue, Neutral-White. For 120/240 volt single phase 3 wire Black/Red, Neutral-White. For 480 volt, three phase, 3 wire Brown/Orange/Yellow. All ground conductors color coding shall be solid green. Any other conductor color coding shall be coordinated with and approved by the Owner's Representative. Power conductors #6 AWG and smaller shall have continuous factory colored insulation without exception; power conductors larger than #6 AWG shall be color-coded with marking tape.
- C. Motor Starters. Motor starters shall be provided with nameplates identifying the controlled equipment and source of power such as MCC-X, PP-X, etc. Pilot controls and indicating lights shall have engraved or etched legends ("start", "stop", etc.) as indicated on the Drawings. Nameplates shall be laminated black-over-white plastic, with 1/8 inch engraved letters, and shall be securely fastened to the motor starters.
 - D. Control Stations. Control stations shall be provided with nameplates identifying the related controlled equipment. Pilot controls and indicating lights shall have engraved or etched legends ("start", "stop", etc.) as indicated on the Drawings. Nameplates shall be laminated black-over-white plastic, with 1/8 inch engraved letters, and shall be securely fastened to the control stations.
 - E. Circuit Breakers. Circuit breakers shall be provided with nameplates identifying the controlled equipment and source of power. Nameplates shall be laminated black-over-white plastic, with 1/8 inch engraved letters, and shall be securely fastened to the circuit breakers.
 - F. Disconnect Switches. All switches shall have front cover-mounted permanent nameplates that include switch type, manufacturer's name and catalog number, and horsepower rating. An additional nameplate, shall be provided identifying the controlled equipment and source of power. Additional nameplates shall be laminated black-over-white plastic, with 1/8 inch letters, shall be provided to identify the associated equipment. Both nameplates shall be securely fastened to the enclosure.
 - G. Arc Flash Hazard Labels. Lighting panels, power panels, power centers, motor starters, and disconnect switches shall be provided with permanent labels warning the risk of arc flash and shock hazard. Labels shall be designed in accordance with ANSI Z535.4-1998 and shall include the following:

“WARNING

Arc Flash and Shock Hazard

Appropriate personal protection equipment (PPE) required. SEE NFPA 70E.

Equipment must be accessed by qualified personnel only.

Turn off all power sources prior to working on or inside equipment.”

Additional information shall be provided on the labels where specified in the Arc Flash Hazard Analysis section of this specification.

- 1.5 SUBMITTALS. Complete assembly, foundation, and installation Drawings, together with complete engineering data covering the materials used, parts, devices, and accessories forming a part of the work performed by the Contractor, shall be submitted in accordance with the Submittals Section 01300. The Drawings and data shall include, but shall not be limited to, the following:

1. Drawings and data.
2. Operating manuals.
3. Samples.

- A. Submittal Identification. Information covering all materials and equipment shall be submitted for review in accordance with the submittals section. Each sheet of descriptive literature submitted shall be clearly marked to identify the material or equipment as follows:

1. Lamp fixture descriptive sheets shall show the fixture schedule letter, number, or symbol for which the sheet applies.
2. Equipment and materials descriptive literature and Drawings shall show the specification paragraph for which the equipment applies.
3. Sheets or Drawings covering more than the item being considered shall have all inapplicable information crossed out.
4. A suitable notation shall identify equipment and materials descriptive literature not readily cross-referenced with the Drawings or specifications.
5. Schematics and connection diagrams for all electrical equipment shall be submitted for review. A manufacturer's standard connection diagram or schematic showing more than one scheme of connection will not be accepted, unless it is clearly marked to show the intended connections.
6. Transient voltage surge suppressor submittals shall include Drawings (including unit dimensions, weights, component and connection locations, mounting provisions, and wiring diagrams), equipment manuals that detail the installation, operation and maintenance instructions for the specified unit(s), and manufacturer's descriptive bulletins and product sheets.

Contractor shall submit the name and qualifications of the Engineering and Testing Services firm proposed to perform the coordination study and the on site testing.

Within 90 days after the Notice to Proceed, Contractor shall furnish a submittal for all types of cable and conduit to be provided. The submittal shall include the cable manufacturer and type, and sufficient data to indicate that the cable and conduit meet the specified requirements.

In addition to the complete specifications and descriptive literature, a sample of the largest size of each type of cable shall be submitted for review before installation. Each sample shall include legible and complete surface printing of the cable identification.

- 1.6 PROTECTION AND STORAGE. During construction, the insulation on all electrical equipment insulation shall be protected against absorption of moisture, and metallic components shall be protected against corrosion by strip heaters, lamps, or other suitable means. This protection shall be provided immediately upon receipt of the equipment and shall be maintained continuously.

PART 2 - PRODUCTS

- 2.1 CABLE. All cables of each type (such as lighting cable or 600 volt power cable) shall be from the same manufacturer.

- A. Lighting Cable. Lighting cable THHN-THWN shall be provided only in lighting and receptacle circuits operating at 277 volts or less. Lighting and receptacle circuits, 8 AWG or larger, shall be as specified for 600 volt XHHW-2 power cable.
- B. 600 Volt Power Cable. Cable in power, control, indication, and alarm circuits operating at 600 volts or less, except where lighting, multiconductor control, and instrument cables are required, shall be 600 volt XHHW-2 power cable.
- C. Instrument Cable. Cable for electronic circuits to instrumentation, metering, and other signaling and control equipment shall be UL 62, Type TFN – UL 1277 with aluminum polyester tape shield and tinned copper drain wire for two- or three-conductor instrument cable twisted for magnetic noise rejection and protected from electrostatic noise by a total coverage shield.

- D. Network Cable. Category 6 UTP Cable. Cat-6 cable shall meet the following requirements:

Physical Characteristics:

1. Shall be plenum rated.
2. The cable jacket shall be round and the color Blue.
3. The diameter of the copper conductor shall be .023 in. maximum.
4. Shall consist of (4) 23 AWG twisted pairs with spiral isolation member
5. Shall be suitable for the environment in which they are to be installed.
6. The color coding of pairs shall be:

Pair 1	W-BL; BL

Pair 2	W-O; O

Pair 3	W-G; G

Pair 4	W-BR; BR

7. The overall diameter of the cable shall be 0.350 inches or less.
8. Cable shall be third party verified to meet ISO/IEC 11801:2002 Category 6.

Transmission Characteristics:

1. DC resistance of any conductor shall not exceed 17.0 Ohms per 100m max. Measured in accordance with ASTM D 4566.
2. The propagation delay of any pair at 250MHz shall not exceed 511ns/100m
3. Performance characterized to 600MHz
4. Performance Characteristics as measured at 250MHz
 - a) Maximum insertion loss 28.2dB/100m
 - b) Minimum NEXT 55.9dB/100m
 - c) Minimum PSNEXT 53.3dB/100m
 - d) Minimum Return Loss 30.3dB/100m
 - e) Minimum ACR 27.6dB/100m
 - f) Minimum PSACR 25.4dB/100m.
5. Minimum 3dB NEXT performance above Category 6

Plenum rated cable shall have FEP insulation jacketing and FEP insulation for conductors. Non plenum rated cable shall have PVC insulation jacketing and polyethylene insulation for conductors. Cat-5e cable shall be Belden 1500 or equal.

Ethernet Patch Cables. Pre-wired and terminated patch cables with RJ-45 connectors and lever protecting boot shall be furnished for all connections to computers, network equipment, and controller equipment except where physical conditions (i.e. length over 12 ft. or conduit size) require un-terminated wire to be installed. Patch cables shall be Cat-6 for networks speeds greater than 100 MHz and shall meet the requirements of Cat-6 cable specified in this section. Straight through cables shall be wired using the T568-B standard for both connectors. Crossover cables shall be wired using the T568-A standard for one connector and the T568-B standard for the opposite end.

2.2 CONDUIT. Conduit and raceways shall be as described in the following paragraphs:

- A. Rigid Steel Conduit. Rigid steel conduit shall be heavy wall, hot-dip galvanized, shall conform to ANSI C80.1, and shall be manufactured in accordance with UL 6.
- B. Liquidtight Flexible Metal Conduit. Liquidtight flexible metal conduit shall be hot-dip galvanized steel, shall be covered with a moisture-proof polyvinyl chloride jacket, and shall be UL labeled.
- C. Rigid Nonmetallic (PVC) Conduit. PVC conduit shall be heavy wall, Schedule 40, UL labeled for aboveground and underground uses, and shall conform to NEMA TC-2 and UL 651.
- D. F.Innerduct. The innerduct shall be smooth-walled, inside and outside, High Density Polyethylene (HDPE) plastic Type SDR9 deliverable to the site on reels. All innerduct shall be the same inner and outer diameter and shall be acquired from the same vendor.

The innerduct shall be extruded from high-density polyethylene (HDPE) resin and conforming

to the minimum standards for polyethylene PE345430B as defined in ASTM D3350.

Each innerduct shall be solid color coded as shown on the plans.

The innerduct shall be suitable for heat fusion welding using a fusion duct splicer.

Innerducts shall be pre-lubricated during the manufacturing process such that the lubricant becomes permanently impregnated in the inner walls of the innerducts. The process shall provide a dynamic co-efficient of friction of .06 to .09 in accordance with Bellcore Standard GR-TSY-356-CORE, Oct. 1995, Section 4.1.5.

The lubricant shall be compatible with the proposed fiber optic cable jacket.

- 2.3 WIRING DEVICES, BOXES, AND FITTINGS. Concealed conduit systems shall have flush-mounted switches and convenience outlets. Exposed conduit systems shall have surface-mounted switches and convenience outlets.

A. Conduit Boxes and Fittings.

1. Galvanized or cadmium plated, threaded, malleable iron boxes and fittings shall be manufactured by Crouse-Hinds, Appleton, or OZ Gedney. In applications utilizing aluminum conduit systems, aluminum boxes and fittings manufactured by Crouse-Hinds, Appleton, or OZ Gedney shall be installed.
2. Rigid PVC device boxes and fittings shall be manufactured by Carlon or Cantex.
3. Sheet steel device boxes shall be manufactured by Appleton, Raco, or Steel City.
4. Hub arrangements on threaded fittings shall be the most appropriate for the conduit arrangement to avoid unnecessary bends and fittings.
5. Conduit bodies shall be Form 8.

B. Device Plates.

1. Galvanized or cadmium-plated device plates shall be used on surface mounted outlet boxes where weatherproof plates are not required.
2. Device plates on flush mounted outlet boxes where weatherproof plates are not required shall be AISI Type 302 stainless steel, Eagle "93nnn series", Hubbell "S series", or Leviton "840nn-40 series"; nylon or polycarbonate, Eagle "513nV series", Hubbell "Pn series", or Leviton "807nn-I series".
3. Device plate mounting hardware shall be countersunk and finished to match the plate.
4. Device plates for switches outdoors or indicated as weatherproof shall have provisions for padlocking switches "On" and "Off", and shall be Appleton "FSK-1VS", Crouse-Hinds "DS185" or O Z Gedney "FS-1-WSCA".
5. Device plates for receptacles indicated as weatherproof shall be Appleton "FSK-WRD", Crouse-Hinds "WLRD1 ", or O Z Gedney "FS-I-WDCA".

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6. Flush-mounted, weatherproof plates shall be provided with adapter plates, Appleton "FSK-SBA" or Crouse-Hinds "FS031".
7. Device plates for ground fault interrupter receptacles indicated to be weatherproof shall be Appleton "FSK-WGFI", Eagle "966", or 0 Z Gedney "FS-1-GFCA".
8. Receptacle covers outdoors or otherwise indicated to be weatherproof while in-use (WPI), and all covers for surge protection receptacles shall be die cast aluminum and shall include a padlock eye. Covers for standard convenience outlets shall be Hubbell "WP8M" or Thomas and Betts Red Dot "CKMDV". Covers for ground fault interrupter receptacles shall be Hubbell "WP26M" or Thomas and Betts Red Dot "CKMGV".
9. Engraved device plates, where required, shall be manufactured by Leviton, or equal.
10. Device plates on PVC conduit fittings shall be Carlon "E98 Series" or Cantex "513300 Series".
11. All device plates for light switches and receptacles shall have identification markers with source panel and circuit designation.

Identification markers shall be machine printed with 1/8 inch letters and numbers.

C. Wall Switches.

1. Switches on ac lighting panel load circuits through 277 volts shall be 20 amperes, 120/277 volts, Eagle "2221 V" through "2224V", Hubbell "HBL 12211" through "HBL 12241", or Leviton "1221-21" through "1224-21".
2. Switches for pulse control of lighting contactors shall be 20 amperes, 120/277 volts, momentary, double-throw, center "Off", Eagle "2220V", Hubbell "15571" or Leviton "1257-I".
3. Switches on ac lighting panel load circuits through 277 volts in Class 1, Division 1 and Division 2, Group D (Area Type 7A or 7B) hazardous areas indicated on the Drawings shall be 20 ampere, 120/277 volts with factory sealed tumbler switches, Appleton "EDS" or Killark "FXS".

D. Receptacles.

1. Standard convenience receptacles shall be duplex, three-wire, grounding, 20 amperes, 125 volts, Eagle "5362V", Hubbell "53621" or Leviton "5362-I" for 120 volt circuits, and 250 volts, Eagle "5462V", Hubbell "54621" or Leviton "5462-I" for 240 volt circuits.
2. Ground fault circuit interrupter receptacles shall be duplex, 20 amperes, 125 volts, Eagle "GF8300V", Hubbell "GF53621" or Leviton "8899-I".
3. Receptacles in Class 1, Division 1 and Division 2, Group D (Area Type 7A or 7B) hazardous areas indicated on the Drawings shall be three-wire, grounding, 20 amperes, 125 volts, factory sealed, with an integral switch that is only activated when an

approved matching plug is fully inserted and rotated into the engaged position; and be Appleton "ENR", Crouse-Hinds "ENR", or Killark "UGR".

4. Weatherproof in-use GFI receptacles shall be furnished outdoors and in sprinkled, wet, and damp (Area Type 4) locations and where indicated on the Drawings.

- 2.4 JUNCTION BOXES, PULL BOXES, AND WIRING GUTTERS. Indoor boxes (larger than switch, receptacle, or fixture type) and gutters shall be constructed of sheet steel, shall be galvanized after fabrication, and shall be rigidly supported by hot-dip galvanized hardware and framing materials, including nuts and bolts.

All outdoor mounted junction boxes, pull boxes and wiring gutters shall be NEMA Type 4X rated and shall be constructed from Type 304 Stainless Steel. All outdoor mounted junction boxes, pull boxes and wiring gutters shall be rigidly supported by PVC-coated or stainless steel framing materials. Mounting hardware, which includes nuts, bolts, and anchors, shall be stainless steel. All damaged coatings shall be repaired according to the manufacturer's instructions.

Indoor boxes and gutters located in Area Type 1A shall be NEMA 4X, ABS or stainless steel, and shall be rigidly supported by non-metallic framing materials.

In indoor chemical feed and storage (Area Type 1A) areas all junction boxes, pull boxes and wiring gutters shall be NEMA Type 4X rated and shall be constructed from Type 304 Stainless Steel. All junction boxes, pull boxes and wiring gutters shall be rigidly supported by PVC-coated or stainless steel framing materials. Mounting hardware, which includes nuts, bolts, and anchors, shall be stainless steel. All damaged coatings shall be repaired according to the manufacturer's instructions.

Bolt-on junction box covers 3 feet square or larger, or heavier than 25 lbs, shall have rigid handles. Covers larger than 3 by 4 feet shall be split.

Where indicated on the Drawings, junction and pull boxes with a removable side opposite the underground conduits shall be provided over building ends of underground conduit banks. Boxes shall be sized in accordance with the National Electrical Code, including space for full size continuations of all underground conduits not originally continued. Conduit arrangement shall leave maximum space for future conduits.

No junction box, electrical pull box, or wiring gutter shall be smaller than 6 inches high by 6 inches wide by 4 inches deep. Latches on junction boxes, electrical pull boxes and wiring gutters smaller than 16 inches high by 14 inches wide by 6 inches deep shall be stainless steel Quick Release Latch (JIC Style) similar to E-BOX "model JQRL". Latches on junction boxes, electrical pull boxes, and wiring gutters larger than 16 inches high by 14 inches wide by 6 inches deep shall be stainless steel Quick Release Latch similar to E-BOX "Model N4QRL".

- 2.5 LIGHTING FIXTURES. Lighting fixtures shall be furnished as described in the fixture schedule as indicated on the Drawings. Lighting fixtures shall be furnished complete with lamps. Pendant fixtures shall have swivel type box covers and threaded conduit pendants unless otherwise specified.

- 2.6 LIGHTING PANELS. Each lighting panel shall be a dead-front, 120/240 volt, single phase or 120/208 volt, three phase panelboard with circuit breakers, in accordance with the Drawings and the following:

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- A. Cabinet. The panel shall have a surface-mounted enclosure with a NEMA 12 or NEMA 4X designation as indicated on the Drawings. The enclosure shall have a hinged trim cover. Breaker operating handles shall be accessible through a latched, lockable, door. At the completion of the contract, a neatly printed or typed directory listing the panel and circuit identities shall be mounted inside the door.
 - B. Circuit Breakers. Circuit breakers shall be thermal-magnetic, bolt-in, individually front replaceable, and shall indicate "On", "Off", and "Tripped". Breakers indicated as multiple-pole shall be common trip. Breakers shall have interrupting ratings as indicated on the Contract Drawings, whichever is greater. Handle clips to prevent casual operation of breakers shall be provided for 10 percent (at least two) of the breakers and applied to the circuits directed. Breakers and provisions for future breakers shall be provided in the quantities, number of poles, and ampere ratings indicated on the Drawings.
 - C. Buses. The panel shall have main and neutral buses insulated from the cabinet, and a ground bus. Buses shall be copper, with ampere ratings and main lugs or breaker as indicated. The ground bus shall be similar to a neutral bus and shall have a good ground connection to the cabinet, a removable bond to the neutral bus, clamp type lugs for the ground cable in each supply conduit, and connections for a ground cable in each load conduit.
- 2.7 POWER PANELS. Unless otherwise specified, each power panel, without a neutral, shall be dead-front, 3 phase panelboard with circuit breakers, in accordance with the Drawings and the following:
- A. Cabinet. The panel shall have a flush-mounted or surface-mounted enclosure with a NEMA 12 or NEMA 4X rating designation as indicated on the Drawings. The enclosure shall have a hinged trim cover. Breaker operating handles shall be accessible through a latched, lockable, door. At the completion of the contract, a neatly printed or typed directory listing the panel and circuit identities shall be mounted inside the door.
 - B. Circuit Breakers. Circuit breakers shall be thermal-magnetic, bolt-in, individually front replaceable, and shall indicate "On", "Off", and "Tripped". Breakers indicated as multiple-pole shall be common trip type. Circuit breakers over 250A shall have adjustable instantaneous trip settings. Interrupting ratings shall be as indicated on the Contract Drawings. Handle clips to prevent casual operation of breakers shall be provided for 10 percent (at least two) of the breakers and applied to the circuits directed.
 - C. Buses. The panel shall have 3 phase buses, a neutral bus insulated from the cabinet, and a ground bus. Buses shall be copper, with ampere and voltage ratings and main lugs or breakers as indicated. The ground bus shall be similar to a neutral bus and shall have a good ground connection to the cabinet, a removable bond to the neutral bus, clamp type lugs for the ground cable in each supply conduit, and connections for a ground cable in each load conduit.
- 2.8 TRANSIENT VOLTAGE SURGE SUPPRESSION.
- A. Scope. Transient voltage surge suppression (TVSS) devices shall be provided as specified herein and as indicated on the Drawings. Each unit shall be designed for parallel connection to the wiring system and shall utilize nonlinear voltage-dependent metal oxide varistors (MOV) in parallel.

TVSS devices shall be furnished and installed for the electrical equipment indicated on the

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Drawings or as specified herein. All new lighting and power panels shall be furnished with integral TVSS devices.

Lighting panels shall be rated for the low exposure level capacity unless otherwise noted.

Power panel shall have TVSS devices rated for a medium-high exposure levels.

- B. Standards. The specified unit shall be designed, manufactured, tested and installed in compliance with the following standards:

1. ANSI/IEEE C62.41 and C62.45;
2. ANSI/IEEE C62.1 and C62.11;

National Electrical Manufacturers Association (NEMA LS1 Guidelines); National Fire Protection Association (NFPA 20, 70 [NEC], 75, and 78); Underwriters Laboratories UL 1449 Second Edition and 1283

The unit shall be UL 1449 Second Edition Listed as a Transient Voltage Surge Suppressor and UL 1283 Listed as an Electromagnetic Interference (EMI) Filter.

- C. Environmental Requirements.

1. Operating Temperature: -40°F to +140°F.
2. Relative Humidity: Reliable operation with 5 percent to 95 percent non-condensing.

D. Electrical Requirements.

1. Unit Operating Voltage. The nominal unit operating voltage and configuration shall be as indicated on the Drawings.
2. Maximum Continuous Operating Voltage (MCOV). The TVSS device shall be designed to withstand a MCOV of not less than 115 percent of nominal RMS voltage.
3. Operating Frequency. Operating frequency range shall be 47 to 63 Hertz.
4. Protection Modes. All protected modes are defined per NEMA LS-1, Paragraph 2.2.7. Following IEEE Standard 1100, section 9.11.2 recommendations, Four-wire configured systems shall provide, Line-to-Neutral (L-N), Line-to-Ground (L-G), and Neutral-to-Ground (N-G), and Line-to-Line (L-L) protection. Three-wire configured systems shall provide Line-to-Line (L-L) protection and Line-to-Ground (L-G) protection.
5. Rated Single Pulse Surge Current Capacity. The rated single pulse surge current capacity, in amps, for each mode of protection of the unit shall be as required and shall be no less than listed in the following table.

	L-N	L-G	N-G	L-L
High Exposure Level	120 kA	120 kA	120 kA	120 kA
Medium-High Exposure Level	100 kA	100 kA	100 kA	100 kA
Medium Exposure Level	80 kA	80 kA	80 kA	80 kA
Low Exposure Level	60 kA	60 kA	40 kA	60 kA

6. UL 1449 Second Edition Suppression Voltage Rating (SVR). The maximum SVR per mode for the device (inclusive of disconnect) shall be as required and shall not exceed the following:

Voltage	L-N	L-G	N-G	L-L
120/240 1-phase	500 V	500 V	500 V	800 V
120/208 3-phase	500 V	500 V	500 V	800 V
240V3W		800V		800V
240 V 4W	800 V	800 V	500 V	1500 V
480 V 3W		1500 V		1800 V

7. Noise Attenuation. EMI noise rejection or attenuation values shall be measured in accordance with test and evaluation procedures outlined in NEMA LS-1. The unit shall be capable of a minimum -40 dB attenuation at 100 kHz when tested per the 50 ohm insertion loss method as defined by MIL-STD-220A.
8. Minimum Repetitive Surge Current Capacity. The minimum number of repetitive surges per mode as a result of testing a 20 kV, 10 kA ANSI/IEEE C62.41 Category C3 surge current with less than a 10 percent degradation of clamping voltage shall be as follows:

For integral and external installation and power panels: 5,000. For lighting panels:

3,500.

9. Overcurrent Protection. At high and medium-high exposure levels, the TVSS device shall incorporate internal fusing capable of interrupting, at minimum, up to 200 kA symmetrical fault current with 600 volts ac applied.

At medium and low exposure levels, the TVSS device shall incorporate internal fusing capable of interrupting, at minimum, up to 65kA symmetrical fault current with 600 volts ac applied.

The device shall be capable of allowing passage of the rated maximum surge current for every mode without fuse operation.

10. Unit Status Indicators. The unit shall include long-life, externally visible phase indicators that monitor the on-line status of the unit. When furnished integral to the panelboard, the status indicators shall be viewable through a clear window within the panelboard door, or similar provision made to ensure visibility with the door closed.

- E. Warranty. The manufacturer shall provide a minimum Five Year Limited Warranty from date of shipment against failure when installed in compliance with applicable national/local electrical codes and the manufacturer's installation, operation and maintenance instructions.
- F. Installation. The TVSS devices shall be installed according to the manufacturer's recommendations. If possible for the integral units, provide direct bus connections.
- G. Disconnect Switch. Each TVSS device shall be furnished with an integral disconnect switch. The unit shall be UL 1449 Second Edition listed as such, and the UL 1449 Second Edition Suppression Voltage Ratings shall be provided. The disconnect switch shall be fused and capable of withstanding, without failure, the published maximum surge current magnitude without failure or damage to the switch.
- H. Acceptable Manufacturers. Integral TVSS devices shall be manufactured by Cutler-Hammer, General Electric, Siemens Energy & Automation, or Square D. External TVSS devices shall be manufactured by Cutler-Hammer, General Electric, Siemens Energy & Automation, Square D, Control Concepts, or Current Technology. The products of other manufacturers will not be acceptable.

- 2.9 DISCONNECT SWITCHES. Unless otherwise indicated on the Drawings, each disconnect switch shall be 3 pole, nonfusible, 600 volts, with a continuous current rating as indicated on the Drawings.

Switches located indoors shall have NEMA type enclosure designations as required by the locations where they will be installed as indicated on the Drawings. Switches located outdoors shall have NEMA Type 4X stainless steel enclosures. Switches in Area Type 1A and in other areas where contact with corrosive substances may occur shall be NEMA Type 4X enclosures of molded reinforced polyester.

Switches shall have high conductivity copper, visible blades; nontearable, positive, quick-make, quick-break mechanisms; and switch assembly plus operating handle as an integral part of the enclosure base. Each switch shall have a handle whose position is easily recognizable and which can be locked in the "Off" position with three padlocks. The "On" and "Off" positions shall be

clearly marked.

All switches shall be UL listed and horsepower rated, and shall meet the latest edition of NEMA KS1. Switches shall have defeatable door interlocks that prevent the door from being opened while the operating handle is in the "On" position.

- 2.10 LIGHTING AND AUXILIARY POWER TRANSFORMERS. Separately mounted transformers shall be provided in the phases, kVA, and voltages indicated on the Drawings. Transformers shall be self-air-cooled, dry type, wall-or floor-mounted, and enclosed for wiring in conduit. Transformers installed outdoors shall be weatherproof. Transformers shall have at least two full capacity voltage taps. Transformers shall meet NEMA TP1 guidelines for energy efficiency. Transformers shall be bonded to the structure ground ring with the size copper cable indicated on the Drawings one-line diagrams.

- 2.11 HEAT-TRACED PIPING. Piping shall be heat-traced as indicated on the Drawings and as described herein.

Contractor shall provide the services of a qualified heat trace system manufacturer and shall provide the heat trace systems specified herein and as indicated on the Drawings. The manufacturer shall have completed at least five projects of similar size and nature within the past five years. Complete system drawings, showing all power and temperature sensor interconnecting cables along with plan drawings showing the location of all system components, shall be submitted for review and approval. Bill of materials, and internal wiring drawings shall be submitted.

As a minimum, the following heat trace system and all associated devices shall be furnished and installed:

Heat tracing shall be sized to maintain pipe temperatures at 40°F with an outdoor ambient temperature of -20°F.

Electrical requirements: Voltage: 120 Vac, Circuit breaker: Field coordinate if other than 30A GFEPPI type, Safety factor: 10 percent.

Self-regulating or power-limiting parallel circuit construction consisting of an inner core of conductive material between parallel copper bus wires, with inverse temperature – conductivity characteristics with metal overbraid.

Thermostats adjustable between 35 and 200°F with maximum differential range of 9°F, furnished complete with NEMA 4 enclosures in all areas, stainless steel temperature bulb and capillary.

All necessary or required components and accessories, such as power connection boxes, end seals, straps, tape and fitting brackets.

Insulation shall be Fluoropolymer (Teflon).

On all plastic pipe equipped with heat tracing, a layer of conducting tape shall be installed on the pipe before heating cable installation and then again following installation of the heating cable.

- 2.12 EMERGENCY BREAK-GLASS SWITCH. Each break-glass switch for Generator emergency shutoff shall be furnished with a NEMA enclosure as specified herein with hammer, hammer

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clip, and chain. Each switch shall be Eaton "10250TGS" or Schneider-Electric "Type 9001K15" with one normally open and one normally closed contact block, or equal. Five spare glass disks shall be furnished for each switch. When the glass disk is broken with the hammer, the button will return to a normal extended position.

PART 3 - EXECUTION

3.1 INSTALLATION, TESTING, AND COMMISSIONING. All material, equipment, and components specified herein shall be installed, tested, and commissioned for operation in compliance with NECA 1000 - NEIS Specification System. Where required in NECA 1000, testing and commissioning procedures shall be followed prior to energizing equipment.

3.2 POWER SERVICE ENTRANCE. Contractor shall consult the local power utility regarding their service installation requirements, and shall furnish the service equipment in compliance with their requirements and the following.

The Contractor shall coordinate details and timing of service entrance installations with the utility. The Contractor shall complete and submit service applications to the power utility as necessary. The Contractor shall coordinate with the power utility and shall furnish required cable and conduit from the service point as indicated on the Drawings, and establish service to the work site.

3.3 ARC FLASH HAZARD ANALYSIS. Contractor shall commission an Arc Flash Hazard Analysis for each piece of electrical equipment in accordance with OSHA 29 CFR Part 1910, NEC, NFPA 70E, and IEEE 1584 and shall submit an Arc Flash Hazard Analysis report as specified herein.

The Arc Flash Hazard Analysis shall be performed in association with, or as a continuation of, the short circuit study and protective-device coordination study.

A. Arc Flash Hazard Analysis calculations shall lead to a selection of a level of Personal Protective Equipment (PPE) that is a balance between the calculated incident energy exposure and the work activity being performed, while meeting the following concerns:

1. Provide adequate protection.
2. Avoid the need for more protection than is warranted.
3. Results of the Arc Flash Hazard Analysis shall be used to identify the flash-protection boundary and the incident energy at assigned working distances throughout any position or level in the overall electrical generation, transmission, distribution, or utilization system.
4. The analysis shall include, but shall not be limited to, the following:
5. A tabulation of the symmetrical RMS bolted fault current available and X/R ratio at each piece of electrical equipment.
6. A tabulation of the arc fault current available at each piece of electrical equipment.

7. A list containing the incident energy and the flash-protection boundary for all electrical equipment.
 8. A list containing each piece of electrical equipment, its corresponding incident energy, hazard rating, and the required Personal Protective Equipment.
 9. An Engineering and Testing Services firm acceptable to Owner's Representative shall conduct the Arc Flash Hazard Analysis.
- B. Arc Flash Analysis Software. The Arc Flash Hazard Analysis shall be performed using the latest version of SKM Power Tools, ETap, EasyPower or other industry standard software approved by the Engineer. After the final version of the study and analysis are completed and accepted, Contractor shall provide two (2) copies of the electronic file and three copies of the report to Owner's Representative.
- C. Arc Flash Hazard Report. Contractor shall be responsible for submitting complete and accurate arc flash analysis information in the Arc Flash Hazard Report. The report shall be submitted to Owner's Representative for review before the final report is prepared. Contractor shall ensure that calculated values for flash-protection boundary, working distance, incident energy, and required Personal Protective Equipment is submitted and provide substantiation that the information will be prominently displayed on electrical equipment.
- The Arc Flash Hazard Analysis report shall be bound in a standard 8-1/2 by 11 inch three-ring binder and shall be submitted in accordance with Section 01300, Submittals. Final selection of required Personal Protective Equipment shall be subject to review and acceptance by Owner's Representative.
- D. Arc Flash Labeling. After approval of the Arc Flash Hazard Report, Contractor shall furnish and install arc flash warning labels on the applicable electrical equipment. All electrical equipment shall be provided with the appropriate ANSI compliant arc flash labeling. Labels shall include the flash protection boundary distance, incident energy, and minimum required Personal Protective Equipment.
- 3.4 COORDINATION STUDY. Contractor shall commission a short circuit study and protective-device coordination study of relays, fuses, circuit breakers, and all other protective devices and shall submit a coordination report as specified herein. The study shall include the entire distribution system indicated on the power distribution functional diagram starting with the smallest - 480 volt, 3 phase, 60 Hz - circuit protective device on the load end, to the nearest protective device on the power company's line side.

Contractor shall be responsible for and shall ensure that all relays and circuit breakers are set according to the study results.

The study shall include, but shall not be limited to, the following:

Color-coded printouts of coordination curves prepared with calculation software.

A tabulation of all protective relay and circuit breaker trip settings and recommended sizes and types of medium-voltage fuses.

Motor starting profiles for all 50 horsepower and larger motors.

Transformer damage curves and protection, evaluated in accordance with ANSI/IEEE C57.109.

Coordination curve(s) from the power company, if available.

Calculated short-circuit values at all nodes in the distribution system included within the scope of the coordination study.

An Engineering and Testing Services firm acceptable to Owner's Representative shall conduct the coordination study.

Contractor shall be responsible for obtaining the following:

The coordination curves for relays, fuses, and circuit breakers. Transformer damage curves.

Motor data.

Other applicable information for all new and existing electrical equipment.

Contractor shall coordinate with the power company to obtain the required protective device curves and shall be responsible for all the field work associated with obtaining the necessary data on existing relays, circuit breakers, fuses, and transformers to be included in the coordination study.

The available 3 phase, symmetrical fault current at the point of service shall be obtained from the Power Company.

The coordination report shall be bound in a standard 8-1/2 by 11 inch three-ring binder and shall be submitted in accordance with the submittals section. Final selection of all protective device settings or sizes shall be subject to review and acceptance by Owner's Representative.

3.5 CABLE INSTALLATION.

- A. General. Except as otherwise specified or indicated on the Drawings, cable shall be installed according to the following procedures, taking care to protect the cable and to avoid kinking the conductors, cutting or puncturing the jacket, contamination by oil or grease, or any other damage.
 - 1. Stranded conductor cable shall be terminated by lugs or pressure type connectors. Wrapping stranded cables around screw type terminals is not acceptable.
 - 2. Stranded conductor cable shall be spliced by crimp type connectors. Twist-on wire connectors may be used for splicing solid cable and for terminations at lighting fixtures.
 - 3. Splices may be made only at readily accessible locations.
 - 4. Cable terminations and splices shall be made as recommended by the cable manufacturer for the particular cable and service conditions. All shielded cable stress cone terminations shall be IEEE Class 1 molded rubber type. Shielded cable splices shall be tape or molded rubber type as required. Shielded cable splices and stress cone terminations shall be made by qualified splicers. Materials shall be by 3M Company, Plymouth/Bishop, or Raychem Electric Power Products.

5. Cable shall not be pulled tight against bushings nor pressed heavily against enclosures.
6. Cable-pulling lubricant shall be compatible with all cable jackets; shall not contain wax, grease, or silicone; and shall be Polywater "Type X".
7. Cables operating at more than 2000 volts shall be fireproofed in all cable vaults, manholes, and handholes. Fireproofing shall be applied with a half-lapped layer of 3M "Scotch 77 Arc-Proofing Tape", anchored at each end with a double wrap of 3M "Scotch 69 Glass Cloth Tape" or with equivalent tape by Anixter or Plymouth/Bishop.
8. Where necessary to prevent heavy loading on cable connections, in vertical risers, the cable shall be supported by Kellems, or equal, woven grips.
9. Spare cable ends shall be taped, coiled, and identified.
10. Cables shall not be bent to a radius less than the minimum recommended by the manufacturer. For cables rated higher than 600 volts, the minimum radius shall be 8 diameters for nonshielded cable and 12 diameters for shielded cable.
11. All cables in one conduit, over 1 foot long, or with any bends, shall be pulled in or out simultaneously.

Circuits to supply electric power and control to equipment and devices are indicated on the one-line diagrams. Conductors in designated numbers and sizes shall be installed in conduit of designated size. Circuits shall not be combined to reduce conduit requirements unless acceptable to Owner's Representative.

- B. Cable Insulation Test. Conductors with insulation rated 5,000 volts and higher shall be given a field dc insulation test.

The ampacity of direct current testing equipment shall be at least 2,500 microamperes.

Test procedures shall conform to ICEA S-93-639 (NEMA WC 74), 5-46 kV Shielded Power Cable for Use in the Transmission & Distribution of Electric Energy, and the applicable qualification testing standards of AEIC CS-8.

The tests shall be performed by experienced personnel specializing in electrical cable testing. Triplicate copies of test data for each cable shall be submitted to Owner's Representative.

- C. Ethernet Cable Installation. Straight through cables shall be wired using the T568-B standard for both connectors as shown in the table below (connector pin numbers are left to right with the clip down). Crossover cables shall be wired using the T568-A standard for one connector and the T568B standard for the opposite end as shown in the table below.

Connector Pin	568A Wiring Conductor	568B Wiring Conductor
1	White/Green	White/Orange
2	Green	Orange
3	White/Orange	White/Green
4	Orange	Green
5	Blue	Blue
6	White/Blue	White/Blue
7	White/Brown	White/Brown
8	Brown	Brown

- D. Ethernet Cable Testing. Validate the Ethernet cable installation. All test equipment shall bear current calibration certification from a certified calibration laboratory, as appropriate. Each cable shall be tested for open pairs, shorted pairs, crossed pairs, reversed pairs and split pairs. A check off sheet shall be utilized, shall be signed by the technician testing the cables, and shall be submitted for approval. Any identified faults shall be corrected at no additional cost.

- 3.6 CONDUIT INSTALLATION. Contractor shall be responsible for routing all conduits. This shall include all conduits indicated on the one-lines, riser diagrams, and home-runs shown on the Drawings. Conduits shall be routed as defined in these specifications. Where conduit routing is shown on the Drawings, it shall be considered a general guideline and shall be field verified to avoid interferences.

Except as otherwise specified or indicated on the Drawings, conduit installation and identification shall be completed according to the following procedures.

- A. Installation of Interior and Exposed Exterior Conduit. This section covers the installation of conduit inside structures, above and below grade, and in exposed outdoor locations. No conduit shall be exposed in water chambers unless so indicated on the Drawings.

Unless otherwise indicated on the Drawings, Contractor shall be responsible for routing the conduit to meet the following installation requirements:

1. Conduit installed in all exposed indoor locations (except in corrosive areas, as indicated by Area Type 1A on the Drawings) and in floor slabs, walls, and Area Type 7A and 7B hazardous (classified) locations, shall be rigid steel. Exposed conduit shall be rigidly supported by hot-dip galvanized hardware and framing materials, including nuts and bolts.
2. Conduit installed in concrete floor slabs and walls in non-hazardous areas shall be rigid Schedule 40 PVC.
3. Conduit installed in all exposed outdoor locations shall be rigid steel, rigidly supported by stainless steel framing materials. Mounting hardware, which includes nuts, bolts, and anchors, shall be stainless steel. All framing materials shall be provided with endcaps.
4. All conduit containing fiberoptic cable shall be innerduct.
5. Final connections to dry type transformers, to motors without flexible cords, and to other equipment with rotating or moving parts shall be liquidtight flexible metal

conduit with watertight connectors installed without sharp bends and in the minimum lengths required for the application, but not longer than 6 feet unless otherwise acceptable to Owner's Representative.

6. Terminations and connections of rigid aluminum and rigid steel conduit shall be taper threaded. Conduits shall be reamed free of burrs and shall be terminated with conduit bushings.
7. Exposed conduit shall be installed either parallel or perpendicular to structural members and surfaces. Two or more conduits in the same general routing shall be parallel, with symmetrical bends.
8. Conduits shall be at least 6 inches from high temperature piping, ducts, and flues.
9. Conduit installed exposed in corrosive chemical storage and feed area (as indicated by Area Type 1A on the Drawings), shall be rigid Schedule 40 PVC.
10. Rigid Schedule 40 PVC conduit shall have supports and provisions for expansion as required by NEC Article 352.
11. Metallic conduit connections to sheet metal enclosures shall be securely fastened by locknuts inside and outside.
12. Rigid Schedule 40 PVC conduit shall be secured to sheet metal device boxes using a male terminal adapter with a locknut inside or by using a box adapter inserted through the knockout and cemented into a coupling.
13. Conduits in walls or slabs, which have reinforcement in both faces, shall be installed between the reinforcing steel. In slabs with only a single layer of reinforcing steel, conduits shall be placed under the reinforcement. Conduits larger than 1/3 of the slab thickness shall be concrete encased under the slab.
14. Conduits that cross structural joints where structural movement is allowed shall be fitted with concretetight and watertight expansion/deflection couplings, suitable for use with metallic conduits and rigid Schedule 40 PVC conduits. The couplings shall be Appleton Type DF, Crouse-Hinds Type XD, or O-Z Type DX.
15. Conduit shall be clear of structural openings and indicated future openings.
16. Conduits through roofs or metal walls shall be flashed and sealed watertight.
17. Conduit installed through any openings cut into non-fire rated concrete or masonry structure elements shall be neatly grouted. Conduit penetrations of fire rated structure elements shall be sealed in a manner that maintains the fire rating as indicated on the Architectural Drawings.
18. Conduits shall be capped during construction to prevent entrance of dirt, trash, and water.
19. Exposed conduit stubs for future use shall be terminated with galvanized pipe caps.

20. Concealed conduit for future use shall be terminated in equipment or fitted with couplings plugged flush with structural surfaces.
 21. Where the Drawings indicate future duplication of equipment wired hereunder, concealed portions of conduits for future equipment shall be provided.
 22. Horizontal conduit shall be installed to allow at least 7 feet of headroom, except along structures, piping, and equipment or in other areas where headroom cannot be maintained.
 23. Conduit shall not be routed across the surface of a floor, roof, or walkway unless approved by Owner's Representative.
 24. PVC-coated rigid steel conduit shall be threaded and installed as recommended by the conduit manufacturer's installation procedure using appropriate tools.
 25. All conduits that enter enclosures shall be terminated with acceptable fittings that will not affect the NEMA rating of the enclosure.
 26. Nonmetallic conduit, which turns out of concrete slabs or walls, shall be connected to a 90 degree elbow of PVC-coated rigid steel conduit before it emerges. The PVC coated rigid steel conduit shall continue above the concrete slab or wall approximately 6 inches and then shall be connected to conduit for exposed applications.
 27. Power conductors from the power source to a separately enclosed adjustable frequency drive and from the separately enclosed adjustable frequency drive to the load shall be installed in rigid aluminum conduit if the conduit is exposed. If the conduit is installed concealed in concrete the conduit within the concrete shall be rigid steel. The requirement is without exception.
 28. Every exposed interior and exterior spare conduits shall be provided with a #12 AWG pull wire.
- B. Underground Conduit Installation. All excavation, backfilling, and concrete work shall conform to the respective sections of these specifications. Underground conduit shall conform to the following requirements:
1. All underground conduits shall be concrete encased unless indicated otherwise on the Drawings. Concrete encasement within 15 feet of building entrances, under and within 5 feet of roadways, and within 10 feet of indicated future excavations shall be reinforced as detailed on the Drawings.
 2. Concrete encased conduit shall be schedule 40 PVC. Conduits shall have end bells where terminated at walls. All joints shall be solvent welded in accordance with the recommendations of the manufacturer.
 3. Concrete encasement on exposed outdoor conduit risers shall continue to 6 inches above grade, with top crowned and edges chamfered.
 4. Conduit and concrete encasement installed underground for future extension shall be terminated flush at the bulkhead with a coupling and a screw plug. The termination of

the duct bank shall be reinforced with bars 100 diameters long that shall be terminated 2 inches from the bulkhead. Matching splice bars shall be 50 bar diameters long. Each longitudinal bar shall be provided with a Lenton "Form Saver" coupler and plate or a Dayton "Superior DBR" coupler at the bulkhead. The coupler shall be threaded to accept a dowel of like diameter in the future. Threads shall be protected with screw-in plastic caps. A 1-3/4 by 3/4 inch deep horizontal shear key shall be formed in the concrete encasement above and below the embedded conduits. After concrete placement, conduit and bar connector ends shall be cleaned and coated with two coats of thixotropic coal tar.

5. Underground conduits indicated not to be concrete encased shall be rigid Schedule 40 PVC.
6. Underground conduit bend radius shall be at least 2 feet at vertical risers and at least 3 feet elsewhere.
7. Underground conduits and conduit banks shall have at least 2 feet of earth cover, except where indicated otherwise.
8. Underground conduit banks through building walls shall be cast in place, or concreted into boxouts, with water stops on all sides of the boxout. Water stops are specified in the cast-in-place concrete section.
9. Underground nonmetallic conduits, which turn out of concrete or earth in outdoor locations, shall be connected to 90 degree elbows of PVC-coated rigid steel conduit before they emerge.

PVC coated rigid steel conduit shall continue above the concrete approximately 6 inches and then conduit shall be as specified for exposed outdoor locations.

10. Conduits not encased in concrete and passing through walls, which have one side in contact with earth, shall be sealed watertight with special rubber-gasketed sleeve and joint assemblies or with sleeves and modular rubber sealing elements.
 11. Underground conduits shall be sloped to drain from buildings to manholes. All underground spare conduits shall be provided with a #12 AWG stranded pull wire.
 12. Each 5 kV or higher voltage cable, each 250 kcmil or larger cable, and each conduit group of smaller cables shall be supported from manhole walls by Kindorf "D-990" or Unistrut "P-3259" inserts, with Kindorf "F-721-24" or Unistrut "P-2544" brackets and Unistrut "P1753" or "P1754" fiberglass reinforced polyester cable saddles.
 13. Telephone cables shall not be installed in raceways, conduits, boxes, manholes, or handholes containing other types of circuits.
 14. Communication and instrument cables shall be separated the maximum possible distance from all power wiring in pull-boxes, manholes, and handholes.
- C. Sealing of Conduits. After cable has been installed and connected, conduit ends shall be sealed by forcing nonhardening sealing compound into the conduits to a depth at least equal to the conduit diameter. This method shall be used for sealing all conduits at handholes, manholes, and

building entrance junction boxes, and for 1 inch and larger conduit connections to equipment.

Conduits entering chlorine feed and storage rooms shall be sealed in a junction box or conduit body adjacent to the point of entrance.

Conduits entering Area Type 7A or 7B hazardous (classified) areas and submersible or explosion proof enclosures shall have Appleton "Type ESU" or Crouse-Hinds "EYS" sealing fittings with sealing compound.

- D. Reuse of Existing Conduits. Existing conduits may not be reused.

3.7 WIRING DEVICES, BOXES, AND FITTINGS INSTALLATION. Metallic and nonmetallic conduit boxes and fittings shall be installed in the following locations:

- A. Conduit Boxes and Fittings.

1. Galvanized or cadmium plated, threaded, malleable iron boxes and fittings shall be installed in concrete walls, ceilings, and floors; in the outdoor faces of masonry walls; and in all locations where weatherproof device covers are required. These boxes and fittings shall also be installed in exposed rigid steel conduit systems.
2. Galvanized or cadmium plated sheet steel boxes shall be installed in the indoor faces of masonry walls, in interior partition walls, and in joist supported ceilings.
3. Rigid PVC device boxes shall be installed in exposed nonmetallic conduit systems.
4. PVC coated boxes and fittings shall be installed in PVC coated conduit systems.
5. Telephone conduit shall be provided with separate junction boxes and pull fittings.

- B. Device Plates. Oversized plates shall be installed where standard-sized plates do not fully cover the wall opening.

- C. Wall Switches.

1. Wall switches shall be mounted 3'-6" above floor or grade.
2. After circuits are energized, all wall switches shall be tested for proper operation.

- D. Receptacles.

1. Convenience outlets shall be 18 inches above the floor unless otherwise required.
2. Convenience outlets outdoors and in garages; in basements, shops, storerooms; and rooms where equipment may be hosed down; shall be 4 feet above floor or grade.
3. After circuits are energized, each receptacle shall be tested for correct polarity and each GFCI receptacle shall be tested for proper operation.
4. Conduit and wire for convenience outlet installation is not shown on the Drawings and shall be sized, furnished, and installed by Contractor. Conductors shall be minimum

12 AWG and conduit shall be minimum 3/4 inch for convenience outlet installation.

E. Special Outlets.

1. Wall thermostats shall be 4'-6" above the floor unless otherwise required. Thermostats on exterior walls shall be suitably insulated from wall temperature.
2. Telephone outlets shall be 18 inches above the floor unless otherwise required. Telephone outlets outdoors and in garages; in basements, shops, storerooms, and rooms where equipment may be hosed down; shall be 4 feet above floor or grade.

3.8 EQUIPMENT INSTALLATION. Except as otherwise specified or indicated on the Drawings, the following procedures shall be used in performing electrical work.

- A. Setting of Equipment. All equipment, boxes, and gutters shall be installed level and plumb. Boxes, equipment enclosures, metal raceways, and similar items mounted on water- or earth-bearing walls shall be separated from the wall by at least 1/4 inch thick corrosion-resistant spacers. Where boxes, enclosures, and raceways are installed at locations where walls are not suitable or available for mounting, concrete equipment pads, framing material, and associated hardware shall be provided.
- B. Sealing of Equipment. All outdoor substation, switchgear, motor control center, and similar equipment shall be permanently sealed at the base, and all openings into equipment shall be screened or sealed with concrete grout to keep out rodents and insects the size of wasps and mud daubers. Small cracks and openings shall be sealed from inside with silicone sealant, Dow-Corning "795" or General Electric "SCS1200".

3.9 GROUNDING.

- A. General. The electrical system and equipment shall be grounded in compliance with the National Electrical Code and the following requirements:
 1. All ground conductors shall be at least 12 AWG soft drawn copper cable or bar, bare or green-insulated in accordance with the National Electrical Code.
 2. Ground cable splices and joints, ground rod connections, and equipment bonding connections shall meet the requirements of IEEE 837, and shall be exothermic weld connections or irreversible high-compression connections, Cadweld "Exothermic" or Burndy "Hyground". Mechanical connectors will not be acceptable. Cable connections to bus bars shall be made with high-compression two-hole lugs.
 3. Ground cable through exterior building walls shall enter within 3 feet below finished grade and shall be provided with a water stop. Unless otherwise indicated, installation of the water stop shall include filling the space between the strands with solder and soldering a 12 inch copper disc over the cable.
 4. Ground cable near the base of a structure shall be installed in earth and as far from the structure as the excavation permits, but not closer than 24 inches. The tops of ground rods and ground cable interconnecting ground rods shall be buried a minimum of 30 inches below grade, or below the frost line, whichever is deeper.

5. All powered equipment, including lighting fixtures and receptacles, shall be grounded by a copper ground conductor in addition to the conduit connection:
 6. Ground connections to equipment and ground buses shall be made with copper or high conductivity copper alloy ground lugs or clamps. Connections to enclosures not provided with ground buses or ground terminals shall be made with irreversible high-compression type lugs inserted under permanent assembly bolts or under new bolts drilled and inserted through enclosures, other than explosion proof enclosures, or by grounding locknuts or bushings. Ground cable connections to anchor bolts; against gaskets, paint, or varnish; or on bolts holding removable access covers will not be acceptable.
 7. The grounding system shall be bonded to the station piping by connecting to the first flange inside the building, on either a suction or discharge pipe, with a copper bar or strap. The flange shall be drilled and tapped to provide a bolted connection.
 8. Ground conductors shall be routed as directly as possible, avoiding unnecessary bends. Ground conductor installations for equipment ground connections to the grounding system shall have turns with minimum bend radii of 12 inches.
 9. Ground rods not described elsewhere shall be a minimum of 3/4 inch in diameter by 10 feet long, with a copper jacket bonded to a steel core.
 10. Test wells and covers for non-traffic areas shall be molded high density polyethylene. Test wells for traffic areas shall be precast concrete construction rated for traffic duty with concrete or cast iron covers.
 11. A #4/0 bare copper conductor shall be routed in all duct bank concrete and bonded to the ground ring at buildings, structures, and transformers whether indicated on the Drawings or not. Where applicable the conductor shall route through all handholes and manholes and it shall be bonded to all metallic components in the handhole or manhole.
- B. Grounding System Resistance. The ground system resistance shall comply with National Electrical Code. The grounding system design depicted on the contract Drawings is the minimum design required for each building or structure. Each system shall comply with the maximum resistance of 5 ohms to ground. Contractor shall confirm the system grounding resistance with the results of the testing specified herein. Systems exceeding the maximum resistance specified shall be supplemented with additional grounding provisions and retested until the maximum specified resistance is achieved.
- C. Grounding System Testing. The grounding system of each new building or structure and each existing building or structure indicated below, shall be tested to determine the resistance to earth. Testing shall be performed by an independent electrical or grounding system testing organization. Testing shall be completed after not less than three full days without precipitation and without any other moistening or chemical treatment of the soil.
1. New Grounding Systems. Grounding systems of each new building or structure shall be tested for resistance to earth utilizing the three-point fall of potential test as defined by IEEE 81. Testing shall be completed prior to installation of the electrical distribution equipment to ensure the grounding system is isolated from the utility

grounding system and the systems of other structures. The current source probe for the test shall be placed in soil at a distance of 5 to 10 times the distance of the widest measurement across the grounding system ring or grid to ensure adequate measurements outside of the grounding system's sphere of influence. Test probe measurements shall be taken at a distance of one foot from the grounding system reference connection and at each 10 percent increment from the grounding system reference connection to the current source probe location. Test results shall be documented on a graphical plot with resistance in ohms on the vertical axis and distance in feet on the horizontal axis. The results shall clearly indicate a system resistance plateau that confirms a valid test procedure.

2. Grounding System Test Report. A report certified by the testing organization shall be prepared and submitted in accordance with the submittals section. The final report shall include complete testing results for each building or structure, graphical representation of the test point results for the three-point fall of potential method, and complete observations of all site weather conditions and other environmental conditions that may affect the test results. Final acceptance of the results reported shall be subject to the review and approval of Owner's Representative.

- 3.10 LIGHTING FIXTURE INSTALLATION. The Drawings indicate the general locations and arrangements of the lighting fixtures. Fixtures in rows shall be aligned both vertically and horizontally unless otherwise specified. Fixtures shall be clear of pipes, mechanical equipment, structural openings, indicated future equipment and structural openings, and other obstructions.

Conduit and wire for lighting fixture installation is not shown on the Drawings and shall be sized, furnished and installed by Contractor. Circuits to emergency lighting units, exit signs, and fixtures indicated to be night lights shall not be switched. Circuits to lighting fixtures indicated to have emergency battery packs shall include an additional un-switched hot conductor. Conductors shall be minimum 12 AWG and conduit shall be minimum 3/4 inch for lighting fixture installation.

END OF SECTION 16050

SECTION 16160 - ADJUSTABLE FREQUENCY DRIVES

PART 1 - GENERAL

- 1.1 SCOPE. This section covers pulse width modulated (PWM) type adjustable frequency drives (AFD) for the equipment and locations as specified. AFDs shall meet the design conditions and features specified herein. Drives shall be fully coordinated with Process Submersible Pumps as specified in Section 11140.
- 1.2 GENERAL. Equipment furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

Equipment provided under this Section shall be fabricated as specified in this Section and as shown on the schematics and one line diagrams on the Contract Drawings.

One adjustable frequency drive, complete with all required control components, shall be furnished for each motor.

AFDs shall be manufactured and assembled in their entirety at the manufacturer's factory. Systems fabricated or assembled in whole or in part by parties other than the drive manufacturer will not be acceptable.

- A. Coordination. The design of the adjustable frequency drive shall be coordinated with the driven equipment. Contractor shall be responsible for coordinating the collection of data and the design effort to limit harmonics to the levels specified.
- B. General Equipment Requirements. Specification Section 01610 - General Equipment Requirements shall apply to all equipment furnished under this Section. If requirements in this specification differ from those in the General Equipment Requirements, the requirements specified herein shall take precedence.
- C. Dimensional Restrictions. Layout dimensions will vary between manufacturers and the layout area indicated on the drawings is based on typical values. The supplier shall review the Contract Drawings, the manufacturer's layout drawings and installation requirements, and make any modifications required for proper installation subject to acceptance by Owner's Representative.
- D. Workmanship and Materials. Equipment supplier shall guarantee all equipment against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, and leakage, breakage, or other failure. Materials shall be suitable for service conditions.

All equipment shall be designed, fabricated, and assembled in accordance with applicable governing standards. Individual parts shall be manufactured to standard sizes and thicknesses so that repair parts, furnished at any time, can be installed in the field. Like parts of duplicate units shall be interchangeable. Equipment shall not have been in service at any time prior to delivery, except as required by tests.

- E. Governing Standards. The adjustable frequency drive shall be designed, constructed, and tested in accordance with the applicable standards of NEMA, ANSI, UL, and IEEE, and shall be designed for installation in accordance with the NEC.

The equipment covered by this Section shall be listed by UL or a nationally recognized third-party testing laboratory. All costs associated with obtaining the listing shall be the responsibility of Contractor. In the event no third-party testing laboratory provides the required listing, an independent test shall be conducted at Contractor's expense. Before the test is conducted, Contractor shall submit a copy of the testing procedure to Owner's Representative.

- F. Nameplates. Nameplates with the description and designation of each control or indicating device shall be provided. Unless specified otherwise, each drive enclosure shall be provided with a nameplate bearing the unit designation as indicated above. Nameplates shall be black and white laminated phenolic material of suitable size, and shall be engraved with 3/8 inch high letters for the drive designation and 3/16 inch letters for other information. The engraving shall extend through the black exterior lamination to the white center.

Each control device and each control wire terminal block connection inside the enclosure shall be identified with permanent nameplates or painted legends to match the identification on the manufacturer's wiring diagram.

- 1.3 DESCRIPTION. The AFD shall produce an adjustable ac voltage/frequency output and shall be equipped with an output voltage regulator to maintain correct output V/Hz despite incoming voltage variations.

- A. Six-Pulse Drives. Drives for motors rated below 100 horsepower, shall be of the pulse-width modulated type and shall consist of a full-wave diode or gated-open SCR bridge. The rectifier shall convert incoming fixed voltage and fixed frequency to a fixed dc voltage. The pulse-width modulation technology shall be of the space vector type, implemented in a microprocessor that generates a sine-coded output voltage.

The drive inverter output shall be generated by insulated gate bipolar transistors (IGBT) which shall be controlled by six identical base driver circuits. The drive shall not induce excessive power losses in the motor. The worst case RMS motor line current measured at rated speed, torque, and voltage shall not exceed 1.05 times the rated RMS motor current for pure sine wave operation.

- 1.4 SUBMITTALS. Complete assembly, foundation, and installation drawings, together with complete engineering data covering the materials used, parts, devices, and accessories forming a part of the drive shall be submitted in accordance with the submittals section. The drawings and data shall include, but shall not be limited to, the following:

Name of manufacturer.

Types and model numbers.

Rated drive input kVA and output kVA.

Percent efficiency at 100 percent speed and 60 percent speed.

Maximum Btu heat release data and verification of the drive cooling requirements.

Panel interior and front and side exterior view details showing maximum overall dimensions of all drive compartments.

Schematics, including all interlocks.

Wiring diagrams, including all internal and external devices and terminal blocks.

Locations and sizes of electrical connections, ground terminations, and shielded wires.

List of diagnostic indicators.

List of fault and failure conditions that the drive can recognize and indicate for simultaneous occurrence.

List of standard features and options.

Input line protection model numbers and manufacturer's data sheets.

UL 508C Certificate of Compliance for short circuit current rating.

Certification of conformal coating on all printed circuit boards.

- A. Operation and Maintenance Data and Manuals. Adequate operation and maintenance information shall be supplied as required in the Specification Section 01781. Operation and maintenance manuals shall be submitted in accordance with the Specification Section 01300. The operation and maintenance manuals shall be in addition to any instructions or parts lists packed with or attached to the equipment when delivered.
- 1.5 DELIVERY, STORAGE, AND HANDLING. Shipping, handling and storage shall be in accordance with the requirements of Specification Section 01612.

PART 2 - PRODUCTS

- 2.1 ACCEPTABLE MANUFACTURERS. All drives shall be pulse-width modulated type, as manufactured by Cutler Hammer, Rockwell Automation, Siemens-Robicon, Square D, Toshiba or approved equal.
- All adjustable frequency drives shall be a product of the same manufacturer.
- 2.2 PERFORMANCE AND DESIGN REQUIREMENTS.
- A. Performance. The adjustable frequency drive controller shall be of sufficient capacity and shall produce a quality output waveform for stepless motor control from 10 to 100 percent of base speed. The adjustable frequency drives shall be suitable for loads and shall have voltage ratings as follows:

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Drive Location (LCP = Local Control Panel)	Driven Equipment Tag	HP	Input Voltage	Load Type	Enclosure Type
LCP-1	PUMP-1	100	480	Variable Torque (VT)	NEMA 12
LCP-2	PUMP-2	100	480	Variable Torque (VT)	NEMA 12
LCP-3	PUMP-3	100	480	Variable Torque (VT)	NEMA 12

Input Frequency	60 Hz
Input Voltage and Frequency Variation	±10 percent voltage variation, ±2 Hz; imbalance, 2 percent maximum. Continued operation with additional momentary 25 percent voltage dip of 0.5 second duration from nominal input voltage level.
Minimum Drive Efficiency	95 percent at 100 percent speed, 90 percent at 60 percent speed.
Ambient temperature	0 to 40°C.
Relative Humidity	0 to 95 percent non-condensing.
Displacement Power Factor	95 percent or higher throughout the entire operating speed range, measured at drive input terminals.
Drive Service Factor	1.0
Overcurrent Capability	110 percent for 1 minute for variable torque; 150 percent for 1 minute for constant torque.
Volts/Hz Ratio	Voltage varies as the square of frequency over the entire range of the unit for variable torque drives, linear over the entire range of the unit for constant torque drives; except under voltage boost condition.
Acceleration/deceleration Time	Adjustable over a range that meets the requirements of the driven equipment.
Output Speed Regulation	0.5 percent.
Output Frequency Stability	0.5 percent of nominal.

B. Adjustments.

The following drive adjustments shall be provided:

Maximum speed.

Minimum speed.

Linear acceleration time.

Linear deceleration time.

Volts/Hz ratio; linear, squared, and automatic settings.

Voltage boost.

Process follower gain, offset, and bias.

Torque limit.

Critical frequency avoidance with adjustable bandwidth.

- C. Fault Protection. Design of the power circuit shall include provisions for protection against fault conditions as follows.

1. Input Protection.

The drive assembly shall be UL 508C listed. A UL Certificate of Compliance shall be submitted to confirm product compliance with UL 508C and to indicate the short circuit current rating. The short circuit current rating shall meet or exceed the available short circuit current indicated on the Contract Drawings.

Solid state instantaneous overcurrent trip set at 180 percent.

Adjustable overvoltage and undervoltage protection with automatic restart.

Phase loss and reverse phase trip with manual restart.

2. Internal Protection.

AC line, phase-to-phase transient voltage surge suppression utilizing metal oxide varistors. Drive shall meet the requirements of IEEE C62.41.

Power device snubbers.

Power devices rated 2.5 times line voltage.

Instantaneous overcurrent.

Static overspeed (overfrequency) protection.

DC bus overvoltage trip.

Components and labeling that comply with UL 508 requirements. Drives shall be equipped with an automatic discharge circuit to deplete the charge, on the DC capacitor bank to less than 50 volts within 60 seconds after main input power is removed. Labels indicating derivative voltage sources and required wait time for servicing after power removal shall be placed on all applicable enclosures.

Individual transistor overtemperature and overcurrent protection.

Control logic circuit malfunction indication.

3. Output Protection.

Inverse-time motor overload protection adjustable from 10 percent to 100 percent.

Overvoltage protection.

Overfrequency protection.

Short circuit protection (three phase, phase to phase, and ground fault protection).

Protection against opening or shorting of motor leads.

Static overspeed protection.

Stall protection on overload with inverse time overcurrent trip, adjustable current limit from 10 percent to 120 percent.

2.3 CONSTRUCTION. Construction requirements shall be as follows and as specified below:

- A. Fabrication and Assembly. The adjustable frequency drive system shall be shop assembled in a single enclosure using interchangeable plug-in printed circuit boards and power conversion components wherever possible. Shop assembly shall be performed by the drive manufacturer; systems fabricated or assembled in whole or in part by parties other than the drive manufacturer will not be acceptable. Changes to the drive manufacturer's product by a distributor or system integrator are not allowed.

The adjustable frequency drive system shall be designed to fit in the space indicated on the Drawings.

- B. Wiring. Terminal blocks shall be nonbrittle, interlocking, track-mounted type, complete with a marking strip, covers, and pressure connectors. A terminal shall be provided for each conductor of external circuits, plus one ground for each shielded cable. In freestanding panels, 8 inches of clearance shall be provided between terminals and the panel base for conduit and wiring space. Not less than 25 percent spare terminals shall be provided. Terminals shall be labeled to agree with the identification on the submittal drawings. Each control loop or system shall be individually fused, clearly labeled, and located for ease of maintenance.

All grounding wires shall be attached to the sheet metal enclosure with a ring tongue terminal. The surface of the sheet metal shall be prepared to ensure good conductivity and corrosion protection.

- C. Enclosures. The drive shall consist of factory mounted and wired components within an enclosure, arranged so no electrically live components, terminals, or conductors are accessible on the front panel or door when the enclosure door is open.

The complete drive package, including accessories, shall fit into the space indicated on the Drawings.

Relays, terminals, and special devices inside the control enclosure shall have permanent markings to match the identification on the manufacturer's wiring diagrams.

- D. Printed Circuit Boards. All printed circuit boards shall be sprayed on both sides with a conformal coating. The conformal coating shall be a part of the AFD manufacturing process and shall be selectively applied to the circuit board connections only. Heat sinks and resistors on the circuit board shall not be coated. Conformal coating shall be Konform "C416", HumiSeal, or equal.

All plug-in type boards shall be mechanically held at the circuit board connector. Compression fit only at the connector will not be acceptable.

- E. AC Line Reactors. Each six-pulse AFD shall be supplied with an input ac line reactor. AC line reactors shall be designed to address performance issues of NEMA MG1-20.55 and to provide proper transient protection of the AFD input power devices. AC line reactors shall be factory mounted and wired within the AFD enclosure. AC line reactors shall be K-rated per IEEE C57-110 and shall be TCI Model KLR, or equal.

2.4 CONTROLS.

- A. Features. Each drive shall include the following features in addition to those indicated on the Drawings:
1. A remote mounted membrane keypad with integral two-line, 24 character minimum LCD display that is capable of controlling the AFD and setting drive parameters. The keypad module shall be programmed with factory set drive parameters in nonvolatile EEPROM or FLASH memory and shall be resettable in the field through the keypad. The rating of the keypad shall match the rating of the panel enclosure.
 2. Manual-automatic and start-stop controls included as features of the drive keypad shall be password protected or disabled to prevent override of control switches and safety interlocks shown on the schematic diagrams.
 3. Microprocessor-based regulator. Nonvolatile memory modules shall have a useful life of at least 20 years without requiring battery or module replacement.
 4. Manual speed adjustment.
 5. Indications of power "On", drive "Run", and drive "Fault".
 6. Speed indication - calibrated in percent rpm.
 7. Automatic controller shutdown on overcurrent, overvoltage, undervoltage, motor overtemperature and other drive fault conditions. Controller shutdown shall be manually reset type. Terminals shall be provided for control wiring from motor temperature switches, or a motor protection relay located in the drive enclosure.
 8. Diagnostic indicators that pinpoint failure and fault conditions. Indicators shall be manually reset to restore operation after abnormal shutdown.
 9. Accept a remote 4-20 mA speed control signal.
 10. Process control output for remote 4-20 mA speed indication, rated 0 to 100 percent speed.

11. Spare interlock contacts rated 5 amperes at 120 volts ac, wired separately to the unit terminal board. One NO and one NC isolated spare interlock shall be furnished with each drive. Additional interlock contacts shall be provided as indicated on the Drawings.
 12. Drive fault and run status contacts for remote indication, rated 5 amperes at 120 volts ac.
 13. Speed droop feature, which reduces the speed of the drive on transient overloads. The drive shall return to set speed after the transient is removed. If the acceleration or deceleration rates are too rapid for the moment of inertia of the load, the drive shall automatically compensate to prevent drive trip.
 14. Coast, controlled ramp, or dc injection selectable modes of stopping.
 15. PID set point control selection.
 16. Adjustable PWM carrier frequency. The inverter output section shall be provided with adjustable PWM carrier frequency from 500 Hz to at least 8 kHz.
 17. Noise level of installed equipment shall not exceed 85 dB, as measured by an appropriate calibrated instrument. The required sound level limit shall be met at a minimum of four locations, each not more than 3 feet above the floor and not more than 10 feet from the equipment. This requirement shall apply to all drives, motors, filters, reactors, and transformers supplied with the drive.
 18. Provide AFD with communications card, protocol and required programming for digital communication of all AFD program and operational parameters to plant control system via Ethernet / IP protocol.
- B. Diagnostics. Diagnostic indicators on the face of the drive shall display the type of fault responsible for drive shutdown, warning, or failure. If two or more faults occur simultaneously, the diagnostic segment shall record or indicate each condition. The drive shall be capable of storing 6 events.
- 2.5 TESTING. All power switching components shall be pre-run under anticipated operating temperature and load conditions. Any alternative testing procedures shall be submitted and pre-approved before proceeding.
- A. Factory Testing. After the drive system has been assembled at the manufacturer's facility, it shall be tested for at least 24 hours before it is shipped.
- The complete drive system, including all peripherals, shall be factory tested under simulated operating conditions, including normal operating sequences and fault conditions. Contact closure inputs and, simulated driven-outputs shall be connected to the system input/output modules.
- A test report summary indicating satisfactory final test results shall be submitted to Engineer before shipment of the equipment.

PART 3 - EXECUTION

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3.1 FIELD QUALITY CONTROL.

- A. Installation Check. An experienced, competent, and authorized representative of the manufacturer shall visit the site of the Work and inspect, check, adjust if necessary, set all relays in accordance with the settings designated in the coordination study, and approve the equipment installation.

The representative shall be present when the equipment is placed in operation and shall revisit the job site as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of Engineer.

The manufacturer's representative shall furnish a written report certifying that the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily.

All costs for these services shall be included in the Contract Price.

- B. Installation Supervision. The equipment manufacturer shall furnish a qualified field installation supervisor during the equipment installation. Such services shall be included in the contract price.

Manufacturers' installation supervisor shall observe, instruct, guide, and direct the installing contractor's erection or installation procedures. The equipment manufacturer will be provided with written notification 10 days prior to the need for such services.

All costs for these services shall be included in the Contract Price. Contractor shall include a minimum of 1 day(s) and 1 trip(s) to the site.

3.2 TRAINING OF OWNER'S PERSONNEL. Provide training as required by Specification Section 01821.

END OF SECTION 16160

SECTION 16721 - FIRE DETECTION AND ALARM SYSTEM

PART 1 – GENERAL

- 1.1 SCOPE. This section covers the design and furnishing and installation of a fire detection and alarm system. All associated equipment, devices, and controls necessary for proper operation of the system shall be included.

The design of the system shall consist of, but shall not be limited to, a determination of the applicable fire and safety codes; an analysis of the various plant ambient temperatures, noise levels and environments (wet, dusty, oily, corrosive, hazardous, etc.); the number and type of fire detectors, alarm indicators, control unit(s), and manual stations required; and the proper wiring and mounting configurations while considering the local seismic design requirements.

Peripheral components as specified shall be located as indicated on the Drawings and provided in sufficient number and located as needed to meet all applicable codes to provide a complete system.

- 1.2 GENERAL. Contractor shall furnish all installation drawings, tools, equipment, materials, and supplies and shall perform all labor to complete the work as specified in compliance with the codes, standards, and regulations listed in this section.
- A. Contractor's Qualifications. The system design, equipment, installation, and installation supervision furnished under this section shall be provided by a single manufacturer or supplier who meet applicable requirement of codes & standards including NFPA 72 and AHJ for the system. The subcontractor must have been engaged in the business of supplying fire alarm systems of this type for at least 5 years.
 - B. General Equipment Requirement. The General Equipment Requirements Section 01610 shall apply to all equipment furnished under this section. If requirements in this section differ from those in the General Equipment Requirements section, the requirements specified herein shall take precedence.
 - C. Governing Standards. Except as modified or supplemented herein, all work covered by this section shall be performed in accordance with the applicable national, state, and local codes and ordinances, laws, regulations, and NFPA Standards which pertain to such work. In case of a conflict between these specifications and any applicable national, state, or local code, ordinance, law, regulation, or NFPA Standard, the latter shall govern.

National Fire Protection Association, NFPA 45, 71, 72, 90A, and 101.

National Electrical Code, Article 760.

All fire alarm equipment and materials, devices, and assemblies shall be listed and/or labeled by Underwriters' Laboratories, Factory Mutual, or another accepted testing laboratory for the intended purpose where acceptable to the authority having jurisdiction. The equipment shall not be altered, installed, or modified in any way that would void the label or listing.

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All control equipment shall have transient voltage protection devices in compliance with UL 864.

The system controls shall be UL listed for Power Limited Applications according to NEC 760. All circuits shall be marked in accordance with NEC 760.10.

- D. Nameplates. Major components of equipment shall be identified with a permanently affixed nameplate bearing the manufacturer's name and address, and type or style and catalog number of the item.
- E. Tags. Keys and locks shall be furnished with tags bearing stamped identification numbers. Cable and conduit runs, wiring circuits, and all spare parts supplied to maintain the system shall be furnished with hard phenolic or stainless steel tags.
- F. Power Requirements. Power supply to the fire alarm control panel (FACP) will be 120 volts, 60 Hz, single phase.

The alarm system shall include an automatically recharged backup power supply with sufficient battery capacity to operate the entire system in the normal supervisory mode for 24 hours and then sound all alarms for 5 minutes. In the event of power failure, the system shall automatically transfer to the standby batteries.

All external circuits requiring system-operating power shall be suitable for 24 volt DC service and shall be individually fused at the control panel.

- G. Spare Parts. Spare parts as specified below shall be supplied with the fire detection and alarm system. Spare parts shall be suitably packaged for shipment.

Spare Parts	Quantity
Smoke detectors and heat detectors	One of each type used
Manual pulls stations	One of each type used
Audiovisual alarms	One of each type used

- 1.3 SUBMITTALS. Complete electrical wiring diagrams; assembly and installation drawings; detailed specifications; and data covering the materials used and the parts, devices, and other accessories forming a part of the equipment furnished shall be submitted in accordance with the Submittal section.

The subcontractor shall provide all documentation as required by NFPA 72.

Contractor shall provide signed and sealed plans by a registered engineer in the state of where required by local or state requirements. The equipment submittals shall include the following:

A complete description of all system components, including certification of listing by the required testing laboratory.

Complete sequence of operation for all functions of the system.

Complete system wiring diagram for all components and interfaces to equipment supplied under other sections.

Location drawings for all controls, alarm actuating devices, and audiovisual alarm signaling devices.

A listing of the manufacturer's representatives responsible for installation and service.

Operation and maintenance manuals.

1.4 OPERATION AND MAINTENANCE DATA AND MANUALS. Adequate operation and maintenance information shall be supplied. Operation and maintenance manuals shall be submitted in accordance with the Submittals sections.

1.5 SYSTEM DESCRIPTION. The fire alarm system shall be operated and monitored by a fire alarm control panel (FACP), located as indicated on the Drawings or in this Section. The FACP shall be located in the Electrical Room at grade level of the new Electrical building. The system shall automatically initiate fire alarm signals whenever any manual or automatic fire detection device is placed in an alarm mode. The system shall transmit system status conditions along with device locations initiating the event to a 24 hours constantly attended location using existing wide area ethernet communication network. The FACP shall annunciate and sound local alarms at the panel location for detection device alarm conditions, system trouble, or circuit failure. Alarm signals shall be consistent throughout the building or site. The operation of any alarm initiating device shall cause audible and visual alarms to sound and to be displayed throughout the building affected by the alarming device. A key-accessible reset function shall reset the alarm system after alarm initiating conditions have been cleared.

The system shall automatically activate smoke detected audiovisual annunciation equipment whenever an area smoke detector is in alarm mode. The system shall identify the device and the location.

A. Fire Alarm System.

Provide an addressable, intelligent, microprocessor based FACP and automatic fire alarm and detection system. Initiating device, notification device, and signaling line circuits shall be NFPA 72, 3-4, Class A. The system shall monitor incoming power and standby power. In addition to the FACP, the system shall include smoke detectors, audiovisual alarm units, end-of-line devices, manual pull stations, wiring connections to devices, outlet boxes, junction boxes, and all other necessary equipment for a complete operating system.

In addition to the FACP, the system shall include interface modules necessary for a complete system.

System trouble, including grounded or open supervised circuit, power failure, system battery low voltage, or system failure, shall cause the system to enter a trouble mode and display visual and audible alarms. The visual alarm shall be displayed until the initiating trouble has been cleared.

B. Activation Sequence. The alarm sequence initiated by the activation of any manual station, automatic detection device shall be as follows:

Selected audible alarm indicating devices shall sound until silenced by the alarm silence switch at the FACP.

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Selected visual alarm indicating devices shall display a continuous strobe pattern until the system is reset.

A supervised signal shall notify the remote supervising station.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS. The new fire alarm system, including all panels and peripheral devices, shall match the existing fire alarm system, which is Edwards type EST-3. No other manufacturers are allowed. The manufacturer's name shall be displayed on each component.

2.2 REMOTE SENSORS.

- A. Fire Alarm Pull Stations. Addressable pull stations shall communicate the station's status (alarm, normal) over two wires that also supply power to the pull station. The address shall be set on each station. The stations shall be manufactured from high-impact red Lexan. Lettering shall be raised and painted white. When activated, the stations shall mechanically latch and remain latched until they are manually reset using a key common to all locks.

The location "address" of the pull stations shall be capable of field programming from the FACP over the signaling line circuit.

- B. Smoke Detectors. Analog addressable smoke detectors shall be of the photoelectric type and shall communicate actual smoke chamber values to the system control panel. The sensors shall be solid-state, containing no radioactive material, and shall be capable of detecting up to seven sensitivity levels between 0.5 and 3.7 percent.

The sensors shall be plug-in units mounted on a twist-lock base. Smoke detector bases shall be common with the heat detector bases and shall be compatible with other addressable detectors and addressable manual stations on the same circuit. The detectors shall be suitable for both ceiling and wall mounting and shall have a 30-mesh insect screen. Detector bases shall contain a light emitting diode that will flash each time it is scanned by the control panel. When the sensor detects smoke or fails, the diode shall illuminate to indicate the abnormal condition. When required, detector bases shall be provided with a relay driver output that may be controlled either automatically or manually from the fire control panel.

Each detector shall contain a magnetically actuated test switch for alarm testing at the sensor location.

- C. Audiovisual Alarm Units. Alarm units shall consist of a horn and a Xenon flashtube installed in a surface or semi-flush wall- or ceiling-mounted enclosure. The horn shall have polarized connections with separate leads for in/out wiring for each leg of the associated signal circuit. Sound level shall be 90 dB at 10 feet.

The visual unit shall operate on 24 volts dc and shall have a white translucent pyramidal lens with the word "FIRE" imprinted in red lettering. The flash rate shall be 1 to 1.5 times per second.

2.3 PANELS.

- A. Fire Alarm Control Panel. The control panel shall be an analog/addressable type fire alarm control panel. The panel enclosure shall be constructed from steel, in compliance with UL 864, with front access door, and shall be surface wall-mounted.

The control panel shall be of modular construction, with solid-state, microprocessor-based electronics, and shall display only the primary controls and functions essential to operation during a fire alarm condition. Keyboards or keypads shall not be required to operate the system during fire alarm conditions. A local audible device shall sound during alarm, trouble, or supervisory conditions. The sound that identifies each condition shall be readily distinguishable without having to view the panel. The audible device shall also sound during each key press to indicate that the key has been pressed. The panel shall be fully field programmable from the keypad and capable of downloadable programming from a Windows-based application program. The panel shall include self programming logic capable of automatically programming new addressable field initiating devices.

The following primary controls shall be visible through a front access panel: Eighty-character liquid crystal display, backlit.

Red system alarm LED.

Yellow supervisory service LED. Yellow trouble LED.

Green "power on" LED. Alarm acknowledge key.

Supervisory acknowledge key. Trouble acknowledge key.

Alarm system key. System reset key. Manual evacuation (drill).

The control panel shall include the following functions:

Setting of time and date. LED testing.

Listing of alarm, trouble, and abnormal conditions. Separate enabling and disabling of each monitor point. Separate activation and deactivation of each control point. Changing operator access levels.

Walk-test enable.

Running diagnostic functions. Displaying software revision level. Displaying historical logs.

Displaying card status. Point listing.

The following lists from the points list menu shall be available for maintenance purposes:

All points by address. Monitor points.

Auxiliary controls. Feedback points. Pseudo points.

LED/switch status.

Scrolling through menu options or lists shall proceed in a self-directing manner, guided by prompting messages. The controls for the points list menu shall be located behind an access door.

The control panel shall contain a back lighted 2 line by 40 character liquid crystal display. To conserve standby battery power in the event of an ac power failure, the display shall be lit only during keypad activity.

The display shall consist of both upper case and lower case letters. Lower case letters shall be used for soft key titles and for prompting the user. Upper case letters shall be used for system status information. A cursor shall be visible when information is being entered.

All wiring shall be brought to terminal strips for field connections.

1. Front Panel Operation and Capabilities. Under normal conditions, the front panel shall display a "SYSTEM IS NORMAL" message and the current time and date.

Should an abnormal condition be detected, the appropriate alarm, supervisory, or trouble LED shall flash. The audible signal shall pulse for alarm conditions and sound steady for trouble or supervisory conditions.

The LCD shall display the following information pertaining to the abnormal condition:

Location label (40 characters available).

Type of alarm device - smoke detector and pull station. Point status - alarm, trouble.

Buttons shall be provided to acknowledge alarm conditions and to silence audible alarms in compliance with NFPA 72.

2. Alarm Silencing. When the "ALARM SILENCE" button is pressed, all alarm signals shall cease. Alarm signals shall not be silenced during "alarm silence inhibit" mode.
3. System Reset. Using the "SYSTEM RESET" button shall restore the system to its normal state after an alarm condition has been remedied.

The LCD display shall step the user through the resetting procedure with simple printed messages.

4. Device Status. Complete status of all addressable field devices shall be available through use of the operator keypad and front panel display.
5. History Logging. The system shall be capable of logging and storing 500 alarm, trouble, and operation events in a history log. These events shall be stored in a battery-protected random access memory. Each recorded event shall include the time and date of the occurrence.
6. Silent Walk Test with History Logging. The system shall be capable of being tested by one person. While in testing mode, the alarm activation of an initiating device circuit shall be silently logged as an alarm condition in the historical data file. After

logging the alarm, the panel shall automatically reset.

The momentary disconnection of an initiating or indicating device circuit shall be silently logged in the historical data file as a trouble condition. After logging the trouble condition, the panel shall automatically reset.

Should the walk test feature be on for an inappropriate length of time, it shall automatically revert to the normal mode.

The control panel shall be capable of supporting up to eight separate testing groups, one of which may be in a testing mode while the other (nontesting) groups may be active and operating as normally programmed. After testing is completed, testing data may be retrieved from the system in chronological order to ensure device/circuit activation.

Should an alarm condition occur from an active point that is not in walk test mode; it shall initiate the normal alarm sequence.

7. LED Supervision. All LEDs shall be supervised for burnout or disarrangement. Should a problem occur, the LCD shall display the location numbers of the module and the LED to facilitate location of the affected LED.
8. System Trouble Reminder. In the event of a trouble condition within the system, with the audible signal silenced, the trouble signal shall resound at 24 hour intervals as a reminder that the fire alarm system is not 100 percent operational. Both the time interval and the trouble reminder signal shall be programmable to adapt to the application.
9. Operator Access Levels. Operator access to system functions shall be limited by a key switch and multiple levels of password protection.

The following functions shall be protected:

Alarm Silence.

System Reset. Set Time/Date.

Manual Control.

On/Off/Auto Control.

Disable/Enable.

Clear Historical Alarm Log.

Clear Historical Trouble Log.

Walk Test.

Change Alarm Verification.

Acknowledge keys shall also require privileged access to acknowledge points. If the operator presses an acknowledge key with insufficient access, an error message will be displayed. The points shall scroll with acknowledge key presses to view the points on the list, but the points will not be acknowledged in the database.

10. Wiring. Intermodule wiring for common system functions shall be installed in a supervised cable bus. Disarrangement of the bus shall cause a distinctive "Cable Supervisory" LED to be illuminated in addition to activating the common trouble indicators.

Detector and signal circuits and wiring may be nonpower-limited type and shall comply with the applicable articles of the NEC.

- B. Enclosures. A cabinet of sufficient size shall be provided to accommodate all equipment required. The door of the cabinet shall be equipped with locks and a continuous hinge, providing protection from tampering, yet allowing full view of the various lights and controls. Indoor enclosures shall be of a NEMA type suitable for the area designation. Outdoor NEMA Type 4X enclosures shall be stainless steel.

2.4 CABLE AND RACEWAYS.

- A. Cable. Cable used in the fire alarm system shall be multi-conductor cable, at least 18 AWG size, specifically designed for industrial fire alarm systems and UL listed for indoor/outdoor installations. All cable required for the system shall be furnished by the Contractor.
- B. Raceways. All cable shall be installed in conduit furnished under this section. All conduit shall conform to the applicable paragraphs of the Electrical section.

PART 3 - EXECUTION

- 3.1 GENERAL. All work shall be installed as indicated on the Drawings, and in accordance with applicable codes and NFPA standards, and the manufacturer's diagrams and recommendations, except where otherwise indicated.

All junction boxes furnished hereunder shall be painted red and permanently labeled "FIRE ALARM". A consistent wiring color code shall be maintained throughout the installation.

Installation of equipment and devices that connect to equipment furnished under other sections, or furnished by the Owner, shall be closely coordinated with the suppliers of the equipment and with Owner.

After completion of the installation, Contractor shall clean the inside and the outside of the fire alarm equipment and shall remove all dirt and debris from the site.

- A. Cable. Cable shall be installed as described in the cable installation paragraphs in the Electrical section. The system conductors shall be installed in conduits or junction boxes separate from conductors of other systems. Conduit fill shall meet applicable NEC requirements.
- B. Raceways. Conduit shall be installed as described in the conduit installation paragraphs in the

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- C. Testing. Contractor shall notify Engineer at least 30 days before the performance and acceptance tests are to be conducted. The tests shall be performed in the presence of Engineer. The Contractor shall furnish all instruments and personnel required for the tests. A complete test report and letter of completion shall be submitted to Engineer. The tests shall be performed by, or under the supervision of, a qualified representative of the fire alarm system manufacturer and shall include, but not limited to, the following:

Verify that the system is free of grounds or open circuits. The FACP shall indicate when a ground or an open circuit exists.

Verify that all alarm signal devices, stations, transmitters, automatic detectors, and supervisory devices are functioning as specified.

Test each fire alarm device and circuit. Individually activate each manual initiating station and verify correct alarm operation and control panel response. Individually test each automatic initiating device and verify correct alarm operation, control panel response, and remote equipment operation.

Test battery backup systems for specified capacity.

Repeat test to verify correction of any defect found in the initial testing.

- 3.2 TRAINING. The manufacturer's representative shall provide training of Owner's personnel as described in the Testing, Startup and Training Requirements specification. All costs for training services shall be included in the Contract Price.

16721-S01. Fire Detection and Alarm Systems

Zone	Area or Rooms Protected	System Type	Notes
1	Electrical Room	Automatic smoke detection	Alarm Notification throughout the area. Connected to FACP
2	Rest Room	Automatic smoke detection	Alarm Notification throughout the area. Connected to FACP

END OF SECTION 16721

SECTION 16725 - ELECTRONIC SECURITY EQUIPMENT

PART 1 - GENERAL

- 1.1 SCOPE. This section covers furnishing the design and the furnishing and installation of, closed circuit television equipment (CCTV), an intrusion alarm and access control system, including all associated equipment, devices, and controls necessary for proper operation. Electronic security system components shall be compatible with existing New York Thruway Authority security equipment. System shall be setup for transmission of intrusion alarms and card reader access via ethernet.
- 1.2 GENERAL. The Contractor shall furnish all installation drawings, tools, equipment, materials, and supplies and shall perform all labor to complete the work as specified, and in compliance with all applicable codes, standards, and regulations.

Design of the security equipment shall provide for CCTV surveillance, intrusion alarm and access control. The design shall consist of, but shall not be limited to, an analysis of ambient temperatures, noise levels, light intensities, and environmental conditions (wet, dusty, oily, corrosive, hazardous, etc.) in various areas of the work site; selection of the appropriate cameras, housings, card readers, and intrusion monitoring and alarm devices and the design of the necessary wiring and mounting configurations.

The Drawings indicate a general, functional arrangement for the equipment. The Supplier shall review the Drawings and supply equipment that meets the functional requirements indicated, and shall furnish and install additional or differing components if required.

- A. Supplier's Qualifications. The design, equipment, installation, and installation supervision furnished under this Section shall be provided by the manufacturer or supplier which is used in the existing NYS Thruway Authority security equipment.
- B. General Equipment Requirements. The General Equipment Requirements shall apply to all equipment furnished under this section.
- C. Governing Standards. All wiring and components shall meet the applicable requirements of the NEC.

All components installed in hazardous areas shall be listed by Underwriter's Laboratories.

- D. Nameplates. Major components of equipment shall be identified with a permanently affixed nameplate bearing the manufacturer's name and address, and type or style and catalog number of the item.
- E. Tags. Keys and locks, where required, shall be furnished with tags bearing stamped identification number. Cable and conduit runs, wiring circuits, and all spare parts supplied to maintain the equipment shall be furnished with hard phenolic or stainless steel tags.
- F. Power Requirements. Primary power supply to all components will be 120 volts, 60 Hz, single phase. The Supplier shall be responsible for meeting all additional power supply requirements

and shall furnish any transformers or other power supply equipment needed.

- 1.3 SUBMITTALS. Complete wiring diagrams; assembly and installation drawings; detailed specifications; and data covering the materials used and the parts, devices, and other accessories forming a part of the equipment furnished shall be submitted in accordance with the Submittals section. The equipment submittals shall include the following:

A complete description of all components, including certification of listing by UL.

Complete sequence of operation for all functions of the equipment.

Complete wiring diagram for all components and interfaces to equipment supplied under other sections or by the Owner.

Location drawings for all components.

A listing of the manufacturer's representatives responsible for installation and servicing.

Operation and Maintenance Manuals.

Installation and mounting details for equipment

Drawings and details of databases, reports, and badge designs.

Detailed wiring diagrams for all interfaces to related equipment.

- 1.4 OPERATION AND MAINTENANCE DATA AND MANUALS. Adequate operation and maintenance information shall be supplied. Operation and maintenance manuals shall be submitted in accordance Section 01300.

- 1.5 SYSTEM DESCRIPTION.

The access control system and intrusion alarm equipment shall be furnished as a complete package consisting of all equipment necessary to integrate the new Electrical Building and the existing Wetwell into the site-wide access control system including all required hardware and software, access controllers, proximity card readers, gate position switches, access cards, and other required appurtenances as required to ensure a complete functional system.

The intrusion alarm and access control shall operate in parallel and act as a single functioning system. All conduits shall be routed back to a single panel location.

The CCTV components shall be a complete package consisting of cameras, interconnecting cables, and appurtenant devices as specified in this section or as required to make the equipment functional. System shall transmit video feeds from CCTV camera system to a remote Thruway Authority monitoring location via ethernet.

Refer to Electrical Drawings for general locations of cameras.

- 1.6 COMPONENTS. Where required by NEC or local codes, all security equipment and materials, devices, and assemblies shall be listed and/or labeled by UL or another accepted testing laboratory for the intended purpose. The equipment shall not be installed, altered, or modified

in any way that would void the label or listing.

All control equipment shall have transient voltage protection devices in compliance with UL 864.

Components shall be provided in sufficient numbers and located as required to meet the Supplier's design.

PART 2 - PRODUCTS.

2.1 ACCEPTABLE MANUFACTURERS. Lenel S2. No other manufacturer will be accepted.

2.2 ACCESS CONTROL / INTRUSION EQUIPMENT.

- A. Security Panel. The security panel shall be constructed from steel, in compliance with UL 864, with front access door, and shall be surface wall- mounted.

The panel shall be of modular construction, with solid-state, microprocessor based electronics, and shall display only the primary controls and functions essential to operation during an alarm condition. A local audible device shall sound during alarm. An audible device shall also sound during each keypress to indicate that the key has been pressed.

The panel shall be capable of monitoring 8 hardwired zones and shall be expandable to 16 zones. Normal power supply shall be 120 V ac. An integrally mounted sealed battery shall provide emergency power for operating the equipment in standby mode for 24 hours. Programmable timers shall be provided for the following:

Entry delay.

Exit delay.

Access.

Alarm cut-off.

Delay before audible burglar output.

The following primary controls shall be visible through a front access panel: 48-character liquid crystal display.

12-digit keypad.

8 LED indicators.

The security panel shall be provided with a minimum of 16 relay outputs for interfacing with the process control system. Each relay shall be programmable to be actuated when an intrusion is detected from any of the keypads or when any locally connected alarm is sensed. Initial configuration of the relays shall actuate a separate relay when an alarm is sensed at each keypad. In addition, one of the relays shall be configured as a common alarm, which actuates

when any alarm (keypads or local) is sensed.

The security panel shall be provided with a 7-day clock for time control and for time stamping of alarms.

At least five user authorization levels shall be provided to control access and modification of the parameters.

- B. Keypads. Keypads shall be specifically designed for operation with the security panel and intrusion detection devices to be provided. The keypads shall serve as a means of terminating / sensing intrusion alarms, arming/disarming the intrusion alarms wired to that keypad, and interfacing with the security panel. Each keypad shall be capable of interfacing with the main control panel and at least four local, supervised intrusion alarm circuits. If the design requires more than four local alarm circuits for a given keypad, an expansion module or alternate keypad shall be provided to allow interfacing with the alarm circuits indicated.

The keypad shall be programmable to generate an immediate alarm when an intrusion alarm is detected, or to provide a time delay during which a programmable disarm code can be entered. If the time delay is utilized and the disarm code is entered before the time delay has expired, no alarm shall be generated. Keypad arm/disarm status shall be adjustable from the security panel or on a programmable calendar/time basis.

- C. Intrusion Switches. Intrusion switches shall be magnetic type, suitable for the intended installation. All required mounting hardware and interconnecting wiring shall be provided. Switches shall be provided with double pole-double throw contacts for connection to alarm controllers, programmable logic controllers, or other remote alarming devices.
- D. Access Control System Software. All necessary software shall be provided to have a fully functional and integrated access control system.
- E. Card Reader Controllers. Each respective card reader controller shall interface with the proximity card readers, door position switches, and electric lock sets.

Each card reader controller shall have 48 hour battery backup for its clock and memory functions, and shall remain operational, with integrity of all timed functions, when isolated from the remainder of the access control system.

Local memory shall store up to 1,800 events when isolated from system controller.

Each card reader controller shall process proximity card reader entrance requests, monitor door position switches and provide a control output to unlock a door or open a gate when an authorized access card is read by the proximity card reader. In addition each card reader controller shall be independently programmable for card recognition and time based access control.

Power supply to the access controller shall be 120 volt single phase. Any voltage other than 120 volt ac shall be provided by power supplies within the access controller and shall be furnished by the System Supplier.

- F. Proximity Card Readers. At minimum shall be of single piece construction, with a continuously illuminated LED to indicate operational status. When a valid proximity card

passes within 7 inches of the reader, the LED will momentarily deactivate to indicate signal processing. All readers shall be coordinated with the associated access controllers and door or gate locks.

Readers shall be powered from power supplies integral to the associated access controller. Readers to be located outdoors shall be weatherproof.

- G. Gate / Door Position Switches. Gate / Door position switches shall be magnetic type or as required by the System Supplier. The switch shall monitor the position of the gate or door and provide feedback to the access controller. All required mounting hardware and interconnecting wiring shall be provided. Switches shall be provided with contacts as required.

2.4 CCTV EQUIPMENT.

- A. CCTV Cameras. CCTV cameras shall be a ¼ inch format CCD type day/night color cameras. CCTV cameras shall receive power over Ethernet. The camera shall be provided with an auto iris lens and an outdoor enclosure suitable for wall, parapet or pole mounting. Outdoor camera enclosures shall be provided with heaters to prevent the formation of condensation or frost. Cameras shall be Axis Q1602-E, or approved equal.

2.5 CABLE AND RACEWAYS.

- A. Cable. Cable used for the CCTV equipment and the intrusion equipment shall be multi-conductor cable, at least 18 AWG size, specifically designed for industrial systems and UL listed for indoor/outdoor installations. All cable required for the equipment, except 120 volt ac power, shall be furnished by the Supplier.
- B. Raceways. All cable shall be installed in conduit furnished under this section. All conduit shall conform to the applicable paragraphs of the electrical section.

PART 3 - EXECUTION.

- 3.1 GENERAL. All work shall be installed in accordance with the manufacturer's diagrams and recommendations except where otherwise indicated.

Installation of equipment and devices that connect to equipment specified in other sections, or furnished by the Owner, shall be closely coordinated with the suppliers of such equipment or with the Owner.

After completion of the installation, the Contractor shall clean the inside and the outside of the security equipment and shall remove any dirt and debris from the site.

The Supplier shall provide on-site supervision of installation.

- A. Cable. Cable shall be installed as described in the cable installation paragraphs in the electrical section. The conductors shall be installed in conduits or junction boxes separate from conductors of other systems.

Conduit fill shall meet applicable NEC requirements.

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- B. Raceways. Conduit shall be installed as described in the conduit installation paragraphs in the electrical section.
 - C. Testing. The Contractor shall notify the Engineer at least 30 days before the performance and acceptance tests are to be conducted. The tests shall be conducted in the presence of the Owner. The Supplier shall furnish all instruments and personnel required for the tests. A complete test report and letter of completion shall be submitted to the Engineer. The testing shall be conducted by, or under the supervision of, a qualified representative of the equipment manufacturer and shall include each component and its interaction with other components. The Contractor shall submit the proposed testing procedure with the preliminary operation and maintenance manuals.
- 3.2 TRAINING OF OWNER'S PERSONNEL. The System Supplier shall provide an eight hour on-the-job technical training session of the operation and maintenance of the system to the Owner's designated personnel.

END OF SECTION 16725

ITEM 699.04----25 - MOBILIZATION**1. DESCRIPTION:**

- 1.01 Under this work the Contractor shall provide the following:
- A. Necessary bonds, insurance, and prefinancing and set-up of necessary general plant, including shops, storage areas, Engineer's and Contractor's offices and such sanitary and other facilities as are required by local or state law or regulation.
 - B. Critical path method (CPM) schedule of operations as described in §108-01 of the TA Addendum.
 - C. M/WBE participation program meeting the M/WBE goals of the contract as described in §109-06 *Contract Payments* and in accordance with §102-12 *D/M/WBE Utilization*.

2. MATERIALS:

- 2.01 Unless otherwise specified, such materials as required for mobilization and are not to be part of the completed contract shall be as determined by the Contractor, except that they shall conform to any pertinent local or state law, regulation or code.

3. CONSTRUCTION DETAILS:

- 3.01 The work required to provide the above facilities and service for mobilization shall be done in a safe and workmanlike manner and shall conform with any pertinent local or state law, regulation or code. Good housekeeping consistent with safety and other requirements of this contract shall be maintained.

4. METHOD OF MEASUREMENT:

- 4.01 Payment for mobilization will be made on a lump sum basis.

5. BASIS OF PAYMENT:

- 5.01 The amount bid for mobilization shall not exceed four percent (4%) of the total contract bid price excluding the bid price for mobilization. Should the bidder exceed the foregoing four percent (4%), the Authority will make the necessary adjustment to determine the total amount bid based on the arithmetically correct proposal.

The amount bid shall include the furnishing and maintaining of services and facilities noted under Section 1.01 to the extent and at the time the Contractor deems them necessary for its operations, consistent with the requirements of this work and the contract.

The amount bid shall be payable to the Contractor with the first contract payment made for other contract work following acceptable completion of all requirements noted under Section 1.01.

Payment will be made under:

<u>Item Number</u>	<u>Item</u>	<u>Pay Unit</u>
699.04----25	Mobilization	Lump Sum

SPECIAL NOTES

CONFIDENTIAL INFORMATION

1. **Confidential Information:** “Confidential Information” means any information not generally known to the public, whether oral or written, that the Authority claims is confidential and discloses to Contractor for the purposes of performing work on the Project. Confidential Information may include, but is not limited to, operational and infrastructure information relating to: bid documents, plans, drawings, specifications, reports, product information and data, business and security processes and procedures; personnel and organizational data, and financial statements; information system IP addresses, passwords, security controls, architectures and designs; and such other data, information and images that the authority deems confidential. The Authority will identify written Confidential Information by marking it with the word “Confidential” and will identify oral Confidential Information as confidential at the time of disclosure to the Contractor.
2. **Exempt Materials:** Confidential Information does not include information which, at the time of the Authority disclosure to Contractor; (a) is already in the public domain or becomes publicly known through no act of Contractor; (b) is already known by Contractor free of any confidentiality obligations; (c) is information that the Authority has approved in writing for disclosure; or (d) is required to be disclosed by Contractor pursuant to law so long as Contractor provides the Authority with notice of such disclosure requirement and an opportunity to defend prior to any such disclosure.
3. **Permitted Use:** Contractor may use Confidential Information solely for the purposes of performing work on the Project. Contractor may share Confidential Information with its employees, consultants, sub-consultants, sub-contractors, suppliers, and agents that are necessary to perform work on the Project (“Authorized Personnel”), but must ensure that such Authorized Personnel execute a Confidentiality and Non-Disclosure Agreement as set forth in the Minimum requirements for the Handling and Treatment of Confidential Information. The Authority’s disclosure of Confidential Information to Contractor shall not convey to Contractor any right to or interest in such Confidential Information and the Authority shall retain all right and title to such Confidential Information at all times.
4. **Protections:** Contractor shall hold Confidential Information confidential to the maximum extent permitted by law. Contractor shall safeguard Confidential Information in accordance with the Minimum Requirements for the Handling and Treatment of Confidential Information.
5. **Return of Confidential Information:** Upon the written request of the Authority, Contractor shall return all written Confidential Information to the Authority.

EXTERNAL CONNECTIONS

If in order to perform work on the Project, Contractor must make an external connection to the Authority’s data communications infrastructure and/or access Authority information systems, Contractor shall in all respects comply with all Authority policies and procedures regarding such connections and information systems access and undertake whatever actions are necessary in the discretion of the Authority to ensure such compliance. Contractor shall be responsible for all costs associated with ensuring that its own network security measures comply with all Authority policies and procedures regarding external connections.

**MINIMUM REQUIREMENTS FOR THE
HANDLING AND TREATMENT OF CONFIDENTIAL INFORMATION**

Contractor shall meet the following minimum requirements relative to project information that is identified as **CONFIDENTIAL**.

Authorized Personnel:

Contractor shall require that all authorized individuals or entities (e.g., employees, consultants, sub-consultants, sub-contractors, suppliers and agents) ("Authorized Personnel") to which it discloses **CONFIDENTIAL** information sign a Confidentiality and Nondisclosure Agreement ("Agreement"). Such Agreement shall provide that Authorized Personnel: are personally responsible at all times for protecting **CONFIDENTIAL** information that is in their possession or control; must always use proper precautions to safeguard against the unauthorized access and disclosure of **CONFIDENTIAL** information; must notify Contractor of any known or suspected instances of loss or theft of, or unauthorized access to, **CONFIDENTIAL** information; and must return all **CONFIDENTIAL** information to Contractor upon completion of the project. Contractor shall be responsible for enforcing the provisions of such Agreement through personal observation and supervision of Authorized Personnel and utilization of appropriate processes.

Contractor shall maintain a list of all Authorized Personnel which have access to **CONFIDENTIAL** information and must provide the Authority with such list upon the Authority's request. Contractor shall update such list monthly and notify the Authority of any changes in such list.

Inventory Control:

Contractor shall create and maintain an inventory of all **CONFIDENTIAL** information that it provides to Authorized Personnel. Upon completion of the project, Contractor shall check all **CONFIDENTIAL** information returned from Authorized Personnel against the inventory. Contractor shall provide a copy of the checked inventory to the Authority.

Use and Storage:

Contractor shall implement reasonable processes during normal working hours to prohibit unauthorized individuals from gaining access to **CONFIDENTIAL** information that is within the Contractor's custody and control. At times other than normal working hours, Contractor shall store **CONFIDENTIAL** information in a secure area, such as a fire-proof safe, locked desk, cabinet or other secure storage facility, where access can be controlled. Contractor shall control the access that Authorized Personnel have to **CONFIDENTIAL** information stored in such secure areas through the use of manual or automated locks and keys. Contractor shall maintain a list of Authorized Personnel who have access to such secure areas and the specific **CONFIDENTIAL** information therein.

Reproduction:

Contractor may reproduce **CONFIDENTIAL** information only to the extent necessary to carry out contract performance. Contractor must stamp/mark all **CONFIDENTIAL** information that is reproduced with the word **CONFIDENTIAL** and protect it in the same manner as the original.

Transportation:

To the extent feasible and reasonable, Contractor shall hand deliver **CONFIDENTIAL** information with instructions that only the addressee is allowed to open or view it. Contractor may send **CONFIDENTIAL** information that cannot be hand delivered via the U.S. Postal Service or express mail services (e.g., FEDEX) provided: it is packaged and sealed in a way that does not disclose its contents or the fact that it is **CONFIDENTIAL** information, and a signature from the recipient is required.

Under no circumstances shall a transportation method be used that cannot guarantee that **CONFIDENTIAL** information is accessed only by the intended recipient.

Disposal:

Contractor shall dispose of all **CONFIDENTIAL** information, regardless of its form or format, using a destruction method that prevents its unauthorized retrieval (e.g., crosscut or micro shredding, degaussing).

Loss, Theft or Unauthorized Access:

Contractor shall provide timely notice to the Authority upon discovery of any incident involving the loss or theft of, or unauthorized access to, **CONFIDENTIAL** information.

SPECIAL NOTE:
CONTROL OF MATERIALS

The Contractor's attention is directed to the TA Addendum, Section 106 – CONTROL OF MATERIAL, available from the Authority's website at: <http://www.thruway.ny.gov/business/addendum/index.html>. The Contractor understands and agrees that some or all of the off-site inspection and approval of material such as precast concrete items, structural steel, bridge bearings, concrete structural elements and/or their components to be used on this project will be done by the New York State Department of Transportation (NYSDOT) as the Authority's agent.

The Contractor agrees to the following conditions:

1. Whenever the Contractor receives direction from the NYSDOT regarding the approval/rejection of material that direction constitutes direction by the Authority under the contract and, shall be final and accepted as such by the Contractor.
2. The Contractor will not allow off-site materials subject to inspection and approval of NYSDOT to be shipped to the project site without direct authorization from the NYSDOT.
3. At the Pre-Award Meeting or as soon as practicable, but in any case, before the Pre-Construction Conference, the Contractor will provide the following information to the Thruway Authority's Director, Office of Construction Management, for transmittal to NYSDOT to arrange off-site inspections:
 - A. The name and address of each Manufacturer of all materials, and portions thereof, requiring off-site quality assurance to be incorporated into this highway project.
 - B. The name and address of each Fabricator fabricating each steel item or any portion thereof to be incorporated into this highway project.
 - C. The name and address of each Fabricator manufacturing structural pre-cast/pre-stressed items or any portion thereof to be incorporated into this highway project.
4. The Contractor agrees that it and its Subcontractors and Suppliers will acquire all materials to be incorporated into this Thruway project **only** through Manufacturing, Batching and Fabrication facilities approved by NYSDOT.

AVAILABILITY OF ELECTRONIC BID DATA

1. SUMMARY:

The New York State Thruway Authority (NYSTA) uses Project Bids Software for electronic bidding. Project Bids is a product of the American Association of State Highway and Transportation Officials (AASHTO) that is currently used by the majority of State Departments of Transportation. It is provided free of charge and can be used on almost any Windows-compatible PC. It integrates with many existing electronic bid preparation software and has import/export capability for use with database and spreadsheet systems. Project Bids allows bidders to receive electronic proposal bid item information from the NYSTA's internet web site and to produce both an electronic and a paper-based bid.

For additional information and downloads, see the NYSTA website at:
<http://www.nysthruway.gov/business/contractors/expedite/index.html>.

2. PARTICIPATION AND RELATIONSHIP TO PAPER DOCUMENTS:

The Authority's adoption of electronic bidding does not force any Contractor to bid electronically. Rather, participation is voluntary. If submitting a bid using infotech's Bid Express internet bidding service, no paper is required. If submitting an electronic bid on a CD, DVD or USB device delivered to the Authority in person or via a courier service, **bidders must also submit print outs that match the electronic file**. Project Bids prints a check code on every bid page that must match the check code in the computer file. As the check code changes every time the electronic file is modified, matching the codes verifies that the data on the printed bid is the same as in the electronic file. **In case of discrepancy, the printouts always prevail and are the primary legal document. Therefore, the printouts can be used to make any last-minute changes.**

3. THIRD-PARTY SOFTWARE:

The NYSTA endorses no particular product but expects all such vendors and individuals to voluntarily keep pace with changes in NYSTA specifications.

4. PROPOSAL NOTES AND CHANGES BY AMENDMENT:

Contractors are solely responsible for recognizing and properly responding to any and all special notes and circumstances printed in the Contract Proposal and any and all changes by amendment from the amendment documents and/or notices communicated to them by the NYSTA's Contracts Unit.

Amendments are posted online at: www.thruway.ny.gov/business/contractors/documents/index.shtml.

Whenever an amendment is issued, a Project Bids amendment file will also be issued and must be applied to your electronic bid. Do not bid without carefully reviewing the printed proposal and any and all changes by amendment. Proposal notes and circumstances include, but are not limited to, printed information on alternate, fixed and/or limited cost items and/or special circumstances regarding item placement and use.

SPECIAL NOTE:**REQUIREMENTS FOR CONTRACTOR'S UTILIZATION OF AREAS
OUTSIDE OF THE RIGHT-OF-WAY**

1. Before the contractor can utilize any area outside of the NYS Thruway Authority (NYSTA) Right of Way (or outside of a temporary easement obtained for the project by the NYSTA), for any work associated with this project, written approval to do so shall be obtained from the NYS Thruway Authority through the Project Engineer. The contractor's request for approval shall be in writing and the Authority shall be allowed 2 weeks to review the request and respond.
2. This requirement applies to areas such as, but not limited to: borrow areas, spoil areas, equipment and/or material storage areas, haul roads, batching areas, water points, shop areas, and all similar areas. This requirement does not apply to the Contractor's established and permanent headquarters, commercial borrow sources, commercial gravel pits, commercial quarries, and all similar areas.
3. The contractor's written request for approval shall include a letter report prepared by an Environmental Professional, acceptable to the Authority, documenting the investigation of the proposed site. The expectation is that an Environmental Professional visits the site, performs an assessment of the proposed use against all applicable environmental requirements, and then documents their findings and recommendations. The letter report shall include the following unless otherwise authorized by the Authority:
 - a) A written description of the activities the contractor wishes to perform at the proposed site, including timeframes.
 - b) Maps showing Federal and State regulated wetlands. The area proposed for use shall be depicted on each map.
 - c) A site location map which accurately shows the area proposed for use, adjacent property boundaries/owners, the location of all wetland boundaries observed, and any required erosion and sediment control measures. If present, wetlands shall be delineated in the field by the Environmental Professional with stakes and ribbon, and wetland delineation data forms shall be completed.
 - d) A written statement prepared by the Environmental Professional regarding the presence of any rare animals or plants or significant natural communities. The Environmental Professional shall use the NYSDEC Environmental Resource Mapper to make this determination. If any rare species are identified, then determine if the rare species are listed as endangered or threatened and whether the NYSDEC determines the proposed use may be harmful to the species or their habitat. If so, address to the satisfaction of the NYSDEC.
 - e) A copy of the applicable SPDES permit and any local municipal permits related to use of the site.
 - f) A listing of other Environmental Permits which were obtained by the Authority for the project. These are referenced in the contract proposal.
 - g) A completed NYSTA Property Release form. The form is available through the Project Engineer.
 - h) A plan showing all restoration work. This includes, but is not limited to, plans for grading, surface restoration details, and erosion and sediment control.
4. This requirement does not waive other provisions of the contract related to use of lands outside the Right of Way. Rather, it shall be viewed as supplementary. The following contract provisions still remain in effect:

§107-08 Protection and Restoration of Property and Landscape, Subsection B. Outside the Right of Way
 §107-10 Managing Surplus Material and Waste

COMPLIANCE WITH SPDES REGULATIONS

The Contractor is advised that the NYS Thruway Authority has evaluated Stormwater requirements for this project and has determined that coverage is not warranted under NYS Department of Environmental Conservation's SPDES General Permit for Stormwater Discharges from Construction Activity (GP-0-25-001). The Contractor shall read and understand the requirements of GP-0-25-001. In the event the Contractor's operations, e.g., clearing and grubbing, expanded staging area; will cause an increase in ground disturbance beyond the amount identified in the Contract Documents, coverage under GP-0-25-001 may be required. Prior to commencing these operations, the Contractor should immediately advise the Project Engineer, who will in turn discuss the request with the Project Designer and Division Environmental Specialist or Environmental Point of Contact.

- In the event coverage is required under GP-0-25-001 as a result of these operations, the Contractor will be required to prepare a Stormwater Pollution Prevention Plan (SWPPP) and submit a Notice of Intent (NOI) with the NYS Department of Environmental Conservation.
- In the event coverage is required under GP-0-25-001 as a result of changes made by the Authority, the Authority will be required to prepare a SWPPP and submit a NOI.

In either case, the Contractor will not be allowed to proceed until verification of coverage under GP-0-25-001 has been provided to the Project Engineer. The Contractor shall make no claim against the Authority for delays resulting from preparing a SWPPP, filing a NOI, and seeking verification of permit coverage.

SPECIAL NOTE
EMBODIED CARBON REPORTING and ENVIRONMENTAL PRODUCT DECLARATIONS (EPDs)

Projects must comply with all applicable New York State (NYS) laws and policies to reduce the embodied carbon in building and infrastructure projects, including New York State Executive Order 22 (2022).

These laws and policies require Contractors to submit Environmental Product Declarations (EPDs) for certain building and construction materials supplied to State contracts. EPDs must be Product-specific Type III (Third Party Reviewed), in adherence with ISO 14025 *Environmental Labels and Declarations*, ISO 14044 *Environmental Management – Life Cycle Assessment*, and ISO 21930 *Core Rules for Environmental Product Declarations of Construction Products and Services*. Supply Chain-specific data should be used when available.

For permanently incorporated and temporary use construction materials manufactured and supplied for projects let after December 18, 2024, the Contractor shall ensure that all available EPDs are collected and submitted for asphalt mixtures, concrete mixtures (excluding precast), glass, and steel items when the quantity supplied to the project exceeds the values listed below. Units that are given in this document may differ from units listed in pay items and therefore, the Contractor must perform the necessary quantity conversion(s).

Construction Material	Minimum Quantity for Reporting (for Transportation Projects)
Concrete mixes	200 cubic yards or more (per mix design)
Asphalt mixes	8,000 short tons or more (per mix design)
Steel i. Rebar ii. Hollow Structural Sections iii. Fabricated Steel Plate iv. Hot-Rolled Sections v. Cold-Formed & Galvanized	20,000 pounds or more for rebar (category i.), per fabrication location 15,000 pounds or more for all others (categories ii – v), per fabrication location
Glass i. Flat Glass ii. Processed Glass iii. Insulated Glazing Units	2,000 square feet or more

The Contractor is not required to develop an EPD if one has not been developed by or for the manufacturer or supplier.

For projects that are active during the State Fiscal Year (April 1 - March 31) and are expected or known to meet the minimum quantities for reporting over the duration of the entire project, the Contractor shall complete and submit a “Contractor EPD Material Reporting Form” (Excel .xlsx format). The form is available on the Thruway Authority website at <https://www.thruway.ny.gov/business/contractors/forms/index.html#contractor>. The Contractor must submit the Contractor EPD Material Reporting form and all EPD(s) collected for the project to the Authority by emailing them to CarbonReports@thruway.ny.gov, with the Contract D number in the subject line of all e-mails. Questions about completing the form can be directed to the same e-mail address.

SPECIAL NOTE**DIESEL EMISSION REDUCTION ACT (DERA) REGULATORY COMPLIANCE**

All New York State Thruway Authority (NYSTA) Contractors are made aware that Environmental Conservation Law (ECL) 19-0323 and the New York State Department of Environmental Conservation (NYSDEC) regulation 6 NYCRR Part 248 *Use of Ultra Low Sulfur Diesel (ULSD) Fuel and Best Available Retrofit Technology (BART) for Heavy Duty Vehicles* requires 100% compliance as of December 31, 2019 of all regulated heavy duty diesel vehicles working on all State awarded contracts. A link to NYSDEC's Part 248 Annual Reporting Requirements which states the current deadlines is located at: <https://dec.ny.gov/regulatory/regulations/chapter-iii>. NYSTA and its Contractors are responsible for annual reporting.

All NYSTA Contractors shall make determinations of regulatory applicability for vehicles in their inventory used on active NYSTA contracts during each reporting year. These determinations shall be based on the definition of Heavy Duty Vehicle (HDV) including on and off road diesel vehicles having gross vehicle weights in excess of 8,500 pounds, excluding vehicles that are exempt as defined in 6 NYCRR 248-1.1(b)(14). Contractors shall also quantify ULSD fuel used by regulated vehicles in active contract work during the reporting year.

An electronic copy of 6 NYCRR Part 248 can be accessed at <http://www.dec.ny.gov/regs/2492.html>. Electronic copies of the Regulated Entity Vehicle Inventory Form and the Regulated Entity and Contractors Annual Report Form can be accessed under Part 248 – Use of Ultra Low Sulfur Diesel Fuel and Best Available Retrofit Technology for Heavy Duty Vehicles at the following link:
<https://www.dec.ny.gov/fs/docs/spreadsheets/248annrptfrm.xlsx>.

To allow for required reports to be submitted to NYSDEC by the regulatory deadline of November 1, each year, NYSTA Contractors shall submit DERA annual reports to NYSTA by October 1, of every year reporting the required information from the previous reporting year (i.e., all 2019/2020 information to NYSTA by October 1, 2020, etc.). The following numbered information shall be submitted:

1. Inclusion of “DERA” and calendar year being reported in subject line of email
2. Contact information including firm name, contact person, phone number and e-mail
3. Estimated annual total quantity of ULSD fuel used by covered vehicles on NYSTA contracts
4. Required Fleet information for covered vehicles on NYSTA contracts

Electronic mail submissions can be sent to dieselreport@thruway.ny.gov

SPECIAL NOTES**GREEN CONSTRUCTION REQUIREMENTS****ULTRA LOW SULFUR DIESEL FUEL**

In order to reduce diesel emissions, the Contractor shall use Ultra Low Sulfur Diesel (ULSD) fuel to operate all diesel engines used to complete the work that will operate for 10 hours or more on the contract site. ULSD fuel requirements shall apply to:

- All diesel engines/equipment.
- Stationary and mobile equipment.
- Owned, leased and rented equipment.

The hours the piece of equipment is used to complete the work is defined as the actual time the engine is running. The time may be continuous or discontinuous and includes warm-up periods idling, in traffic periods, etc.

The Contractor shall repair deficiencies when any diesel powered construction equipment is in non-compliance. When non-compliance items are identified by NYSTA, the Contractor will be notified for correction within a 24-hour period.

SPECIAL NOTES**GREEN CONSTRUCTION REQUIREMENTS****CONTROLLING EXPOSURE TO DIESEL EXHAUST**

The Contractor shall exercise measures to protect “Sensitive Receptors” from the impacts of diesel exhaust fumes. Sensitive Receptors include, but are not limited to: hospitals, schools, daycare facilities, building fresh air or ventilation intakes, elderly housing or convalescent facilities. The Contractor shall ensure that diesel powered engines are located away from building air conditioners and windows.

The goal is to minimize exposure of Sensitive Receptors in close proximity to diesel exhaust, in terms of both concentration and time. In general, close proximity is defined as within 15 meters of a Sensitive Receptor. Mitigation techniques include positioning stationary equipment exhausts greater than 15 meters from Sensitive Receptors, extension of equipment exhausts through the use of flexible tubing; protecting building air intakes; and the use of moving operations.

Idling time for diesel powered equipment shall be limited to three consecutive minutes for delivery and dump trucks and all other diesel powered equipment except as follows:

- When a “mobile source” (vehicle) is forced to remain motionless because of traffic conditions or mechanical difficulties over which the operator has no control.
- When it is necessary to operate a loading, unloading or processing device.
- When the outdoor temperature is less than - 3°C (27°F).
- When the “mobile source” is being repaired.

Arrow panels and portable variable message signs shall be solar powered wherever possible or practical.

Whenever possible and practicable, the Contractor shall establish staging areas for diesel powered vehicles waiting to load or unload materials at the work site. Such areas shall be located where diesel emissions have the least impact on Sensitive Receptors and the general public.

SPECIAL NOTES

GREEN CONSTRUCTION REQUIREMENTS

DUST CONTROL

The Contractor shall minimize dust from disturbed soil surfaces or other materials that can cause off-site damage, health hazards and traffic safety problems. Dusty conditions resulting from the Contractor's operations shall be corrected at no additional cost to the State. Buffer areas of vegetation should be left where practical. Water quality shall be considered when selecting materials for dust control. An approved dust palliative may be used in conformance with applicable conditions placed on its use. A list of acceptable dust palliatives is available at: www.nysdot.gov/divisions/engineering/technical-services/geotechnical-engineering-bureau/dust-palliatives .

For areas not subject to traffic, products and materials may be applied or placed on soil surfaces to prevent airborne migration of soil particles, including:

- Vegetative Cover –provides the most practical method of dust control.
- Mulch (including rolled erosion control products) –provides a fast, effective method of dust control.
- Spray Adhesives –Generally composed of polymers in a liquid or solid form mixed with water to form an emulsion that is sprayed on the soil surface. The mixing ratios and application rates will be in accordance with the manufacturer’s recommendations for the specific soils on the site. Adhesives shall not be applied to wet soils or if there is a probability of precipitation within 48 hours.

For areas subject to traffic (traveling public or construction traffic) products and materials may be applied or placed on soil surfaces to prevent airborne migration of soil particles, including:

- Water Sprinkling – The site may be sprayed with water until the surface is wet. This is especially effective on haul roads and access routes.
- Polymer Additives –Polymers shall be mixed with water and applied to the driving surface using mixing ratios and application rates in accordance with the manufacturer’s recommendations. No application of the polymer will be made if there is a probability of precipitation within 48 hours of its proposed use. Any polymers must be used in accordance with the NYSDEC issued “Conditions for Use” and “Application Instructions.” This information can be obtained from the NYSDEC website.
- Barriers – Woven geotextiles or stone can be placed on the driving surface to effectively reduce dust throw and particle migration on haul roads.
- Windbreak – A silt fence or similar barrier can control air currents at horizontal intervals equal to ten times the barrier height. Preserve existing vegetation that acts as a wind barrier as much as practical.
- Wheel Washing – Mechanical or manual wet-method cleaning of on-road construction vehicle tires prior to leaving site.

SPECIAL NOTE**GENERATOR KNOWLEDGE FOR DISPOSAL OF TREATED WOOD**

The U.S. Environmental Protection Agency (EPA) and New York State Department of Environmental Conservation (NYSDEC) technique for evaluating whether a material is hazardous for toxicity is the Toxicity Characteristic Leaching Procedure (TCLP). TCLP testing of pentachlorophenol (“penta”) and creosote treated wood by the Electric Power Research Institute, Association of American Railroads, and others has conclusively demonstrated that treated wood products are not a hazardous waste. Under EPA’s and NYSDEC’s rules, such “generator knowledge” can be utilized in place of testing to determine that a waste is not hazardous. This information can be used as evidence that treated wood products can be disposed as non-hazardous waste, based on generator knowledge, in lieu of physical testing.

Generator knowledge information, obtained from the American Wood Preservers Institute (AWPI) can be viewed at their web site located at www.awpi.org . AWPI’s information comes from studies conducted by the Electric Power Research Institute (EPRI), the Washington Public Ports Association (WPPA), and the Association of American Railroads (AAR). EPRI test results are for both penta-treated and creosote-treated wood. WPPA and AAR test results are for creosote-treated wood.

NOTE: Arsenically-treated (*e.g.*, chromated copper arsenate [CCA]) wood products disposed by the end user are exempt from classification as a federal hazardous waste regardless of the TCLP results for specified constituents from any individual sample. Also, wood products treated with preservatives that contain no TCLP constituents (*e.g.*, Kodiak Preserved Wood containing Copper Dimethyldithiocarbamate) are not hazardous waste.

SPECIAL NOTES
FOREST INSECT DISEASE CONTROL

MOVEMENT OF WOOD MATERIALS FROM PROJECT SITES

Pursuant to New York State Department of Environmental Conservation (NYSDEC) Regulations, 6 NYCRR Section 192.5, *Firewood Restrictions to Protect Forests from Invasive Species*, it is unlawful to transport any firewood material more than 50 miles from its point of origin to limit the spread of invasive insect species. “Firewood” shall mean all wood of any species, cut or not cut, split or not split, regardless of length which is (a) in a form and size appropriate for use as a fuel, or (b) which is destined for use as a fuel. Firewood shall not include kiln-dried dimensional lumber, wood that has been chipped to a maximum piece size that is no greater than 1-inch in two dimensions, or logs or wood being transported to sawmills or other manufacturing facilities for use in their primary operations. All Thruway Authority (TA) projects are subject to this requirement. Additional information can be found at the following link: <https://dec.ny.gov/nature/animals-fish-plants/invasive-species/terrestrial/firewood>

If firewood is to be moved within 50 miles of its point of origin a “Self-Issued Certificate of Origin for Transport and Possession of Untreated Firewood” must be completed. This form can be found at the following link: http://www.dec.ny.gov/docs/lands_forests_pdf/selfisscert.pdf

MARKER RELOCATION DURING CONSTRUCTION
EXISTING MILE MARKERS AND TENTH-MILE MARKERS AND DELINEATORS

All mile markers and tenth-mile markers are to be maintained during construction of this project. The Contractor will be allowed to temporarily relocate them to avoid damage to them or for constructability purposes. The mile markers and tenth-mile markers may be moved but the new location must be visible to traffic and be reasonably close to their original location. The mile markers must be returned to their original location upon completion of construction at that location. Cost for this work shall be included in the bid price for the various pay items in the contract, unless the work is specifically called for in the contract documents.

If the contract calls for replacement of existing mile markers and/or tenth-mile markers, they shall remain in place, or reset to a location reasonably close to their original location, until the new markers are installed.

SPECIAL NOTE**BIRD / BAT WASTE AWARENESS**

The Contractor should be aware that there may be bird/bat waste in the work area. The waste may contain trace amounts of metals and the fungus *Histoplasma capsulatum*. Exposure to this fungus can result in the disease histoplasmosis. Proper health and safety precautions shall be identified in the contractor's health and safety plan in accordance with section 107-05. The disposal facility that accepts the bird/bat waste may need documentation as to its composition to determine that it is non-hazardous and/or otherwise suitable for disposal at that location.

US CUSTOMARY FUEL PRICE ADJUSTMENT

FUEL PRICE ADJUSTMENT ¹ CONVERSION FACTORS		
MATERIAL DESCRIPTION	CONVERSION FACTOR	ITEM NUMBER ^{2,7}
Unclassified Excavation	0.35 gal/yd ³	203.02
Embankment	0.10 gal/yd ³	203.03, 620.XX
Fill	0.45 gal/yd ³	203.05, 203.06, 203.07, 203.08XX, 203.20, 203.21, 203.25
Controlled Low Strength Material	1.00 gal/yd ³	204.01, 204.02, 204.03, 204.04
Trench / Culvert / Structure Excavation	0.50 gal/yd ³	206.01, 206.0201
Bituminous Stabilized Course	1.40 gal/yd ³	302.01, 307.01
Subbase Course	1.00 gal/yd ³	304 Items
Asphalt Mixtures	2.50 gal/ton	404 Items ³ , 405.01, 406 Items ³ , 421 Items ³ , 608.020102 ³ , 619.0601 ⁴ , 624.02XXXX ^{3,4} , 633.14 ^{3,4} , 633.15 ^{3,4} , 633.16 ^{3,4}
Diamond Grinding	0.13 gal/yd ²	505 Items ³
Milling	0.10 gal/yd ²	490 Items
Cold Recycling Asphalt Concrete	0.08 gal/yd ²	416.XXXXXXRR
Portland Cement Concrete Pavement	1.00 gal/yd ³	502 Item ³ , 503.1010, 603.1011, 503.1012
Fill Type Retaining Walls	0.45 gal/yd ³	554.30XX ⁵ , 554.31 ⁵ , 554.4X ⁵
Footing Concrete & Concrete for Structures – All classes	1.00 gal/yd ³	555.0104, 555.0105, 555.05, 555.06, 555.07, 555.08, 555.09, 555.10, 555.11, 555.0011, 555.0012, 555.0021, 555.0022, 555.0031, 555.0032
Structural Approach Slabs	0.33 gal/yd ²	557.2001, 557.2002, 557.2003, 557.2009, 557.22, 557.1011, 557.1012, 557.1013, 557.1019, 557.2019
Superstructure Slabs with bottom formwork	0.25 gal/yd ²	557.01XX, 557.07, 557.30, 557.41XX, 557.1111, 557.1112, 557.1113, 557.1119, 557.13, 557.2119
Superstructure Slabs - no bottom formwork	0.15 gal/yd ²	557.05XX, 557.09, 557.43XX, 557.1211, 557.1212, 557.1213, 557.1219, 557.2219
Overlay Concrete	0.05 gal/yd ²	584.3001nn, 584.3002nn, 584.3009nn, 584.3101nn, 584.3102nn, 584.3103nn, 584.3109nn, 584.3200nn, 584.0301nn, 584.0302nn, 584.0303nn, 584.0309nn, 584.0320nn
Concrete Barrier, Type A	0.16 gal/ft	606.3001, 606.3021, 606.3031
Concrete Barrier, Type B	0.19 gal/ft	569.01, 606.3002, 606.3022, 606.3032
Concrete Barrier, Type C	0.22 gal/ft	606.3003, 606.3023, 606.3033
Concrete Barrier, Half Section	0.11 gal/ft	569.02, 569.06, 606.3004, 606.3024, 606.3034
Concrete Barrier, Single Slope	0.23 gal/ft	569.05, 569.07, 606.3041, 606.3043, 606.3044

US CUSTOMARY FUEL PRICE ADJUSTMENT

FUEL PRICE ADJUSTMENT ¹ CONVERSION FACTORS		
MATERIAL DESCRIPTION	CONVERSION FACTOR	ITEM NUMBER ^{2,7}
Concrete Barrier Texas & Wide, Single Slope	0.28 gal/ft	569.08, 606.3051, 606.3053, 606.3054
Concrete Barrier Half Section, Single Slope	0.17 gal/ft	569.04, 606.3061, 606.3063, 606.3064
Vertical Faced Concrete Parapet	0.10 gal/ft	569.03
Removal and Replacement of Structural Concrete	1.00 gal/yd ³	582.05, 582.0051
Gravel, Stone, Slag	1.00 gal/yd ³	411.01, 411.02, 411.03, 623.1X
Concrete Sidewalks and Driveways	1.00 gal/yd ³	608.01XX
Concrete Curb	0.10 gal/ft	609.04XX, 609.05XX
Topsoil	0.45 gal/yd ³	610.10, 610.11XX, 610.14XX
Turf Establishment - Performance	0.05 gal/yd ³	610.16010020

FUEL PRICE ADJUSTMENT¹ CONVERSION FACTORS**Notes:**

1. In accordance with Standard Specification §698-3.02, the index value for the fuel price adjustment is the posted price for the month of bid letting.
2. Item Number - This is the contract pay item number under which these materials are most frequently paid. Unless indicated otherwise, materials similar to those indicated under the column entitled "Material Description" are also eligible for adjustment using the factor listed for a similar material with the same pay units regardless of the actual contract pay item number.
3. Quality Adjustment Items (404/406/502/505/555/557/569/582/584/608/624) are not eligible for fuel price adjustment.
4. Fuel Price Adjustment Conversion Factor based on units of TONS of asphalt placed, not the pay units of this item.
5. Fuel Price Adjustment Conversion Factor based on units of CY of backfill paid under this item, not the pay units of this item.

Compliance Requirements and Procedures

*For Participation of
Disadvantaged/Minority/Women/Service-Disabled Veteran-Owned
Business Enterprises
and
Equal Employment Opportunity
on
NYS Thruway Authority Contracts
(DBE/MWBE/SDVOB/EEO)*

CONTRACT GOALS FOR DBE/MWBE/SDVOB PARTICIPATION

The New York State Thruway Authority herein after, ("Authority") is committed to providing and ensuring Minority-owned Business Enterprises (MBE), Women-owned Business Enterprises, (WBE) Service-Disabled Veteran-Owned Business Enterprises (SDVOB) and Disadvantaged Business Enterprises (DBE) with opportunities to participate in the Authority's contracting and procurement processes in accordance with Title 49, Part 26 of the United States Code of Federal Regulations (CFR), New York State Executive Law, Articles 15-A, 17-B, and all applicable federal and state laws, rules, regulations and Executive Orders, including but not limited to Executive Order 177 - Prohibiting State Contracts with Entities that Support Discrimination, as incorporated herein and/or contained in the NYS Department of Transportation Standard Specifications Section 102, "Bidding Requirements and Conditions" to the extent applicable to the contract.

Goal(s) have been established for this Contract/Agreement, expressed as a percentage of the total Contract/Agreement amount as follows:

Disadvantaged Business Enterprise - DBE (Federal-Aid)

Disadvantaged Business Enterprise (DBE) Participation Goal: _____%

Directories and/or Information related to the current certification status of Disadvantaged Business Enterprises can be obtained from the New York State Certified DBEs website at: <https://nysucp.newnycontracts.com>

Minority/Women-Owned Business Enterprise - MWBEs (Non Federal-Aid)

Minority Business Enterprise (MBE) Participation Goal _____ 15 %

Women's Business Enterprise (WBE) Participation Goal _____ 15 %

Directories and/or information related to the current certification status of Minority/Women Business Enterprises can be obtained from the New York State Certified MWBE website at: nysucp.newnycontracts.com

Service-Disabled Veteran-Owned Business Enterprise (SDVOB)

Service-Disabled Veteran-Owned Business Participation Goal _____ 6 %

Directories and/or information related to the current certification status of Service-Disabled Veteran Business Enterprises can be obtained from the New York State Certified SDVOB website at: ogs.nv.gov/veterans/

Equal Employment Opportunity

Minority _____ 0 %

Female _____ 0 %

For more information about the development of the goals, see Federal Register, Vol. 45, No. 194, at 65976-65991 (October 3, 1980) (minorities) and Federal Register, Vol. 45, No. 251 at 85750-85751 (December 30, 1980) (females). The text of these Federal Register notices can be found at Federal Register Notice: Vol. 45, No. 194, at 65976-65991 (October 3, 1980)

Training Special Provisions _____ Yes ☒ No

Training/Special Provision supplements each of the foregoing prescribed specific Equal Employment Opportunity percentage goals for utilization of minorities and women in the performance of work for the geographic location of the contract, included in this Proposal entitled "Equal Employment Opportunity (EEO) Requirements."

CHART A

GOALS FOR MINORITY PARTICIPATION

County	%	County	%	County	%
Albany	3.2	Herkimer	2.1	* Richmond	
Allegany.....	6.3	Jefferson	2.5	Rockland	22.6
Broome	1.1	* Kings		St. Lawrence	2.5
* Bronx		Lewis	2.5	Saratoga	3.2
Cattaraugus	6.3	Livingston	5.3	Schenectady	3.2
Cayuga	2.5	Madison	3.8	Schoharie	2.6
Chautauqua	6.3	Monroe	5.3	Schuyler	1.2
Chemung	2.2	Montgomery	3.2	Seneca	5.9
Chenango	1.2	Nassau	5.8	Steuben	1.2
Clinton	2.6	* New York		Suffolk	5.8
Columbia	2.6	Niagara	7.7	Sullivan	17.0
Cortland	2.5	Oneida	2.1	Tioga	1.1
Delaware	1.2	Onondaga	3.8	Tompkins	1.2
Dutchess	6.4	Ontario	5.3	Ulster	17.0
Erie	7.7	Orange	17.0	Warren	2.6
Essex	2.6	Orleans	5.3	Washington	2.6
Franklin	2.5	Oswego	3.8	Wayne	5.3
Fulton	2.6	Otsego	1.2	Westchester	22.6
Genesee	5.9	Putnam	22.6	Wyoming	6.3
Greene	2.6	* Queens		Yates	5.9
Hamilton	2.6	Rensselaer	3.2		

* The following goal ranges are applicable to the indicated trades in the Counties of Bronx, Kings, New York, Queens and Richmond.

Electricians.....	9.0 to 10.2	Bricklayers.....	13.4 to 15.5
Carpenters	27.6 to 32.0	Asbestos workers.....	22.8 to 28.0
Steam fitters	12.2 to 13.5	Roofers	6.3 to 7.5
Metal lathers.....	24.6 to 25.6	Iron workers (ornamental).....	22.4 to 23.0
Painters.....	26.0 to 28.6	Cement masons.....	23.0 to 27.0
Operating engineers	25.6 to 26.0	Glaziers.....	16.0 to 20.0
Plumbers	12.0 to 14.5	Plasterers	15.8 to 18.0
Iron workers (structural)	25.9 to 32.0	Teamsters.....	22.0 to 22.5
Elevator constructors	5.5 to 6.5	Boilermakers	13.0 to 15.5
All others		16.4 to 17.5	

GOALS FOR FEMALE PARTICIPATION

Goal _____ 6.9%

COMPLIANCE REQUIREMENTS AND PROCEDURES

It is the policy of the New York State Thruway Authority (“Authority”) to comply with the provisions of Article 15-A of the New York State Executive Law, which requires that every contract over \$25,000 will afford equality of economic opportunities for minority group members and women, the facilitation of participation by minority-owned business enterprises and women-owned business enterprises. The Authority shall establish separate goals for participation of certified minority-owned business enterprises and women-owned business enterprises on all Authority contracts where applicable.

In addition, it is the policy of the Authority to ensure participation of DBEs on Federal-Aid contracts, pursuant to the provisions of Title 49, Part 26 of the United States Code of Federal Regulations.

Article 17-B of the New York State Executive Law provides for more meaningful participation in public procurement by certified Service-Disabled Veteran-Owned Business Enterprises (“SDVOBs”); thereby further integrating such businesses into New York State’s economy. The Authority recognizes the need to promote the employment of service-disabled veterans and to ensure that certified SDVOBs have opportunities for maximum feasible participation in the performance of Authority contracts.

The Authority is further committed to providing equal training and employment opportunities to minorities and women to participate in the Authority’s contracting and procurement processes, and by ensuring nondiscrimination in accordance with Appendix A - Standard Clauses for New York State Thruway Authority Contracts, including Clause 4 – Non-Discrimination Requirements, Clause 11 - Equal Employment Opportunities for Minorities and Women, Executive Order 11246, Executive Order 177, Training/Special Provisions and/or all applicable, federal, state, laws, rules, regulations and Executive Orders.

1. GENERAL PROVISIONS

- A. The Contractor and/or all subcontractors/subconsultants, shall comply with the applicable laws, rules, regulations and provisions governed by this Contract/Agreement, in addition to any nondiscrimination or diversity practices and provisions of the Contract/Agreement at no additional cost to Authority.
- B. These provisions and requirements shall be included in all subcontracting/subconsultant contracts/agreements so that these requirements and provisions shall be binding upon all subcontractors/subconsultants, performing work under this Contract/Agreement.
- C. The Contractor/Consultant represents and warrants that, as a condition for award of the Contract, the Contractor/Consultant has submitted a Statewide Utilization Management Plan (“SUMP”) via the NYS Contract System (NYSCS) if required by Authority, which lists all proposed Subcontractors/ subconsultants including an identification of the NYS certified DBE/MWBE/SDVOB subcontractors/subconsultants/ suppliers the Contractor/Consultant intends to use to perform the Work of the Contract and to achieve the DBE/MWBE/SDVOB Contract Goals established in the Contract Documents. In addition, or alternatively, Contractor/Consultant may have submitted a request for a waiver. Prior to award of the Contract, the Authority approved Contractor’s/Consultant’s plan to achieve the DBE/MWBE/SDVOB Contract Goals established in the Contract Documents (DBE/MWBE/SDVOB Utilization Plan) to the extent the Authority did not approve Contractor’s/Consultant’s request for a waiver of part or all of the DBE/MWBE/SDVOB Contract Goals. The Authority approval of the DBE/MWBE/SDVOB Utilization Plan approves a Subcontractor/Subconsultant only for the purpose of the DBE/MWBE/SDVOB Utilization Plan.

MBE PROVISIONS FOR NON-FEDERAL AID CONTRACTS AND AGREEMENTS**2. MINORITY/WOMEN-OWNED BUSINESS ENTERPRISES (MWBEs)**

In accordance with Article 15-A of the Executive Law, including regulations promulgated thereunder, the Authority has established the Minority-Owned Business Enterprise (“MBE”) and/or Women-Owned Business Enterprise (“WBE”) participation goals for this Contract/Agreement.. Contractor shall facilitate MWBE participation for the scopes of work to be performed under this Contract/Agreement, to satisfy the participation goals, or document good faith efforts taken to fulfill the goals in a manner prescribed by the Authority in accordance with the Compliance Requirements and Procedures specified herein.

The goals are applicable to the total amount payable under any Contract/Agreement awarded from this procurement and any changes made to the Contract/Agreement.

1. The Authority establishes MWBE goals for all applicable contracts. The MWBE goals for this Contract/Agreement are located on the “Contract Goals” page of this document and can also be found in the contractors/consultants documents for this Contract/Agreement.
2. For purposes of providing meaningful participation to certified MWBEs on this Contract/Agreement and in an effort to attain the certified MWBEs contract goals identified for this Contract/Agreement, the Contractor should reference the directory of MWBEs at the following internet address: ny.newnycontracts.com.
3. The Contractor understands that only sums paid to MWBEs for the performance of a Commercially Useful Function, as that term is defined in 5 NYCRR § 140.1, may be applied towards the achievement of the applicable MWBE participation goal.

In the performance of this Contract/Agreement, the monetary value of fees, or markup percentage, charged by the MWBE shall be deemed to represent the Commercially Useful Function of the MWBE serving as a broker.

4. The Contractor agrees to provide, upon request by the Authority, documentation and/or evidence of actions taken to demonstrate “Good Faith Efforts,” in accordance with 5 NYCRR § 142.8, to provide meaningful participation by MWBEs as subcontractors and suppliers in the performance of this Contract/Agreement.

3. MWBE UTILIZATION REQUIREMENTS

The Contract’s/Agreement’s MWBE goals have been established by the Authority based on certified MWBE availability, job assignments, services to be performed and/or type of work to be performed under the Contract/Agreement.

In the performance of this Contract/Agreement, 60% of the total participation value shall be deemed to represent the Commercially Useful Function of the MWBE serving as a supplier and the mark up and/or broker’s fee shall represent the Commercially Useful Function of the MWBE serving as a broker.

- A. The Contractor shall certify that the Utilization Plan identifies all subcontractors/subconsultants reflected on Exhibit D of the Contract/Agreement.
- B. The Contractor agrees to adhere to the approved MWBE Utilization Plan in the performance of the Contract/Agreement.

- C. The Contractor further agrees that failure to submit and/or adhere to such MWBE Utilization Plan shall constitute a material breach of the terms of the Contract/Agreement. Upon the occurrence of such a material breach, the Authority shall be entitled to any remedy provided herein, including but not limited to, a finding that the Contractor is non-responsible.

Utilization Plan - All Subcontractors (TA-W1022)

4. REPORTING

The Contractor is required to submit forms TA-1023 or TA-W1059 on or before the 10th of each month, following the month being reported. Monthly reports must be submitted via email, to Compliance@thruway.ny.gov, however, during the term of the contract, the Contractor may arrange to provide such reports via a non-electronic method to the Authority by the 10th day following the end of each month during the term of the Contract/Agreement.

TA-W1023 Payments to DBE/MWBE Subcontractor Firms

5. COMPLIANCE

The Contractor will comply with any procedures and guidelines established by the Director of the Division of Minority and Women-Owned Business Enterprise (hereinafter the Director) under the authority of New York State Governor's Executive Order 8, issued August 3, 1983 (hereinafter Executive Order 8) and will comply with any rules, regulations and orders of the Director as may be promulgated pursuant to or under the authority of Executive Order 8, or other applicable law or order.

6. MWBE WAIVERS

- A. Prior to submission of a request for a partial or total waiver, Contractor shall speak to someone from the Authority's Office of Compliance for guidance.
- B. In accordance with 5 NYCRR § 142.7, a Contractor that is able to document good faith efforts to meet the goal requirements, as set forth herein, may submit a request for a partial or total waiver on Form TA-W1077, accompanied by supporting documentation. A Contractor may submit the request for waiver at the same time it submits its MWBE Utilization Plan.

Supporting documentation of good faith efforts shall include, but not be limited to:

1. Evidence of targeted and specific outreach to MWBEs;
2. Logs, written correspondence, records of telephone contacts and other information to document responses from MWBEs to the Contractor outreach;
3. Copies of advertisements for participation by MWBEs in appropriate general circulation, trade, and minority or women-oriented publications;
4. The dates of attendance at any pre-bid, pre-award, or other meetings, if any, scheduled by the Authority with MWBEs; and,

5. Information describing specific steps undertaken by the Contractor to reasonably structure the Agreement's scope of work to maximize opportunities for MWBE participation.
- C. If a request for waiver is submitted with the MWBE Utilization Plan and is not approved by the Authority at that time, the provisions of clauses (C - H) will apply.

If the documentation included with the Contractor waiver request is complete, the Authority shall evaluate the request and issue a written notice of acceptance or denial within 20 business days of receipt.
 - D. Contractor shall attempt to utilize, in good faith, certified MWBEs, during the performance of the Contract/Agreement. Requests for a partial or total waiver of established goal requirements may be made to the Authority, at time of bid/proposal submission, subsequent to award of the Contract/Agreement or at any time during the term of the Contract/Agreement, but must be made no later than prior to the submission of a request for final payment on the Contract/Agreement.
 - E. If the Authority, upon review of the MWBE Utilization Plan and Monthly MWBE Form TA-1023 – Payments to DBE/MWBE/SDVOBs, determines that Contractor is failing or refusing to comply with the Contract's/Agreement's MWBE goals and no waiver has been granted in regards to such non-compliance, the Authority may issue a notice of deficiency to the Contractor.
 - F. The Contractor must respond to the notice of deficiency within seven business days of receipt. Such response may include a request for partial or total waiver of the Contract's/Agreement's MWBE goals.
 - G. If the Contractor, after making good faith efforts, is unable to achieve the MWBE goals stated herein, the Contractor may submit a request for a waiver to the Office of Compliance. Such waiver request must be supported by evidence of the good faith efforts by the Contractor to achieve the maximum feasible MWBE participation towards the applicable MWBE goals. If the documentation included with the waiver request is complete, the Authority shall evaluate the request and issue a written notice of approval or denial within twenty (20) business days of receipt.
 - H. If the Authority, upon review of the MWBE Utilization Plan and the forms TA-W1023 or TA-W1059 as described in Section 4, or any other relevant information, determines that the Contractor is noncompliant, deficient or failing to document the good faith efforts to meet the Contract's/Agreement's MWBE goals or requirements and no waiver has been issued in regards to such non-compliance, the Authority may issue a notice of deficiency to the Contractor. The Contractor must respond to the notice of deficiency letter within seven (7) business days of receipt. Such response may include a request for partial or total waiver of the Contract's/Agreement's MWBE goals.

Waiver requests shall be sent to the Authority's Office of Compliance at Compliance@thruway.ny.gov.

Contractor Forms:

Forms are located at: thruway.ny.gov/business/contractors/forms/index.html

Questions regarding compliance with MWBE participation goals, requirements and provisions should be directed to the Authority's Office of Compliance.

7. NON-COMPLIANCE

- A. Where the Authority determines that the Contractor is not in compliance with the requirements specified herein and/or other contract requirements, refuses to comply with such requirements, or if the Contractor is found to have willfully and intentionally failed to comply with the MWBE participation goals, the Contractor may be found in breach of the contract, which may result in withholding of any mobilization pay item and monthly estimates, a delay in award of the Contract/Agreement, a finding that the Contractor is non-responsible, and/or the Authority may impose liquidated damages.
- B. Such liquidated damages shall be calculated as an amount equaling the difference between:
 - 1. All sums identified for payment to MWBEs had the Contractor achieved the contractual MWBE goals; and
 - 2. All sums actually paid to MWBEs for work performed or materials supplied under the Contract/Agreement.
- C. In the event a determination has been made by the Authority, after Contractor has been afforded due process, which requires the payment of liquidated damages, Contractor shall pay such liquidated damages to the Authority within sixty (60) days after such determination or the Authority shall have the ability to withhold such amount from Contractor unless prior to the expiration of such sixtieth day, the Contractor has filed a complaint with the Director of the Division of Minority and Women's Business Development pursuant to 5 NYCRR § 142.12, in which event the liquidated damages shall be payable or withheld from the Contractor only in the event of a determination adverse to the Contractor following the complaint process.

SERVICE-DISABLED VETERAN-OWNED BUSINESS ENTERPRISES (SDVOB)

Article 17-B of the New York State Executive Law provides for meaningful participation in public procurement by certified Service-Disabled Veteran-Owned Business Enterprises ("SDVOB"), thereby further integrating such businesses into New York State's economy. The Authority recognizes the need to ensure that certified SDVOBs have opportunities for maximum feasible participation in the performance of Authority contracts. In recognition of the service and sacrifices made by service-disabled veterans and in recognition of their economic activity in doing business in New York State, Contractor is required to foster participation of SDVOBs in the fulfillment of the requirements of the Contract/Agreement.

In accordance with Article 17-b of the Executive Law, including regulations promulgated thereunder, the Authority has established the SDVOB participation goals for this Contract/Agreement, set forth in the "Contract Goals" page of this agreement.

Contractor shall facilitate SDVOB participation for the scopes of work to be performed under this Contract/Agreement, and/or document good faith efforts taken to achieve the goals in a manner prescribed by the Authority in accordance with the Compliance Requirements and Procedures specified herein.

1. SDVOB GOALS

The goals are applicable to the total amount payable under this Contract/Agreement and any changes made to the Contract/Agreement.

1. The Authority establishes SDVOB goals for all applicable contracts/agreements. The SDVOB goals for this Contract/Agreement are located on the "Contract Goals" page of this document and can also be found in the procurement documents pertaining to this Contract/Agreement.
2. For purposes of providing meaningful participation to certified SDVOBs on this Contract/Agreement and in an effort to attain the certified SDVOB goals for this Contract/Agreement, the Contractor should reference the directory of SDVOBs at the following internet address: online.ogs.ny.gov/SDVOB/search
3. Contractor must document "Good Faith Efforts" to provide meaningful participation by SDVOBs as subcontractors or suppliers in the performance of the Contract/Agreement (see clause 4 below).

2. SDVOB UTILIZATION PLANS

A. In accordance with 9 NYCRR § 252.2(i), Bidders/Proposers are required to submit a completed SDVOB Utilization Plan on Form TA-W1022 within 10 business days of letting.

B. The Utilization Plan shall list the certified SDVOBs that the Contractor intends to use to perform work on the Contract/Agreement, a description of the work that the Contractor intends the SDVOB to perform to meet the goals on the Contract/Agreement, the estimated dollar amounts to be paid to a certified SDVOB, or, if not known, an estimate of the percentage of Contract/Agreement work the SDVOB will perform. By signing the Utilization Plan, the Contractor acknowledges that making false representations or providing information that shows a lack of good faith as part of, or in conjunction with, the submission of a Utilization Plan is prohibited by law and may result in penalties including, but not limited to, termination of a

contract for cause, loss of eligibility to submit future bids, and/or withholding of payments. Any modifications or changes to the agreed participation by SDVOBs after the award of the Contract/Agreement and during the term of the Contract/Agreement must be reported on a revised Utilization Plan and submitted to the Authority's Chief Compliance Officer for approval.

C. The Authority will review the submitted SDVOB Utilization Plan and advise the Contractor of the Authority's acceptance or issue a notice of deficiency within 20 business days of receipt.

D. If a notice of deficiency is issued, Contractor agrees that it shall respond to the notice of deficiency, within seven business days of receipt, by submitting to the Authority a written remedy in response to the notice of deficiency. If the written remedy that is submitted is not timely or is found by the Authority to be inadequate, the Authority shall notify the Contractor and direct the Contractor to submit, within five business days of notification by the Authority, a request for a partial or total waiver of SDVOB participation goals on Form TA-W1077 Contractor/Consultant Waiver Request. Failure to file the waiver request form in a timely manner may be grounds for disqualification of the bid or proposal.

E. The Authority may disqualify a Contractor's bid/proposal/letter of interest as being non responsive under the following circumstances:

- (a) If a Contractor fails to submit a SDVOB Utilization Plan;
- (b) If a Contractor fails to submit a written remedy to a notice of deficiency;
- (c) If a Contractor fails to submit a request for waiver; or
- (d) If the Authority determines that the Contractor has failed to document and/or demonstrate good faith efforts.

F. If Contractor is awarded a Contract/Agreement, Contractor certifies that it will follow the submitted SDVOB Utilization Plan for the performance of SDVOBs on the Contract/Agreement in accordance with the prescribed SDVOB compliance requirements and procedures for the Contract/Agreement goals set forth in this agreement.

G. Contractor further agrees that failure to use SDVOBs as agreed in the Utilization Plan shall constitute a material breach of the terms of the Contract/Agreement. Upon the occurrence of such a material breach, the Authority shall be entitled to any remedy provided herein, including but not limited to, a finding of Contractor non-responsibility.

3. SDVOB WAIVER

A. Prior to submission of a request for a partial or total waiver, Contractor shall speak with someone from the Authority's Office of Compliance for guidance.

B. In accordance with 9 NYCRR § 252.2(m), a Contractor that is able to document good faith efforts to meet the goal requirements, as set forth herein, may submit a request for a partial or total waiver on Form TA-W1077, accompanied by supporting documentation. A Contractor may submit the request for waiver at the same time it submits its SDVOB Utilization Plan.

If a request for waiver is submitted with the SDVOB Utilization Plan and is not approved by the Authority at that time, the provisions of clauses 2 (C), (D) & (E) will apply. If the documentation

included with the Contractor's waiver request is complete, the Authority shall evaluate the request and issue a written notice of acceptance or denial within 20 days of receipt.

C. Contractor shall attempt to utilize, in good faith, certified SDVOBs, during the performance of the Contract/Agreement. Requests for a partial or total waiver of established goal requirements may be made to the Authority, at time of bid submission, subsequent to Contract/Agreement award or at any time during the term of the Contract/Agreement, but must be made no later than prior to the submission of a request for final payment on the Contract/Agreement.

D. If the Authority, upon review of the SDVOB Utilization Plan and Monthly SDVOB Form TA-1023 Payments to DBE/MWBE/SDVOBs determines that Contractor is failing or refusing to comply with the contract goals and no waiver has been granted in regards to such non-compliance, the Authority may issue a notice of deficiency to the Contractor.

The Contractor must respond to the notice of deficiency within seven business days of receipt. Such response may include a request for partial or total waiver of the Contract/Agreement SDVOB goals.

Waiver requests shall be sent to the Authority's Office of Compliance at Compliance@thruway.ny.gov.

4. GOOD FAITH EFFORTS

In accordance with 9 NYCRR § 252.2(n), Contractor must document their good faith efforts toward utilizing SDVOBs on the Contract/Agreement. Evidence of required good faith efforts shall include, but not be limited to, the following:

- (1) Copies of solicitations to SDVOBs and any responses thereto.
- (2) Explanation of the specific reasons each SDVOB that responded to Contractor's solicitation was not selected.
- (3) Dates of any pre-bid, pre-award or other meetings attended by Contractor, if any, scheduled by the Authority with certified SDVOBs which the Authority determined were capable of fulfilling the SDVOB goals set in the Contract/Agreement.
- (4) Information describing the specific steps undertaken to reasonably structure the Contract/Agreement scope of work for the purpose of subcontracting with, or obtaining supplies from, certified SDVOBs.
- (5) Other information deemed relevant to the waiver request.

5. MONTHLY SDVOB CONTRACTOR COMPLIANCE REPORT

In accordance with 9 NYCRR § 252.2(q), Contractor is required to report Monthly SDVOB Contractor Compliance to the Authority during the term of the Contract/Agreement for the preceding month's activity, documenting progress made towards achieving the Contract/Agreement SDVOB goals.

This information must be submitted by the Contractor, using Form TA-1023 Payments to DBE/MWBE/SDVOBs available on the Authority's website, reflecting the preceding month's activities. Timely, complete and accurate forms must be submitted to

Compliance@thruway.ny.gov, by the 10th day of each month, with a courtesy copy to Thruway Project Engineer (TPE)/Engineer in Charge (EIC).

6. NON-COMPLIANCE

Where the Authority determines that the Contractor is not in compliance with the requirements specified herein and/or other contract requirements, refuses to comply with such requirements, or if the Contractor is found to have willfully and intentionally failed to comply with the SDVOB participation goals, the Contractor may be found in breach of the contract, which may result in withholding of any mobilization pay item and monthly estimates, a delay in award of the Contract/Agreement, a finding that the Contractor is non-responsible, and/or the Authority may impose other breach of contract damages.

7. BREACH OF CONTRACT AND DAMAGES

In accordance with 9 NYCRR § 252.2(s), any Contractor found to have willfully and intentionally failed to comply with the SDVOB participation goals set forth in the Contract/Agreement, shall be found to have breached the Contract/Agreement and Contractor shall pay damages equivalent to the Authority's expenses for personnel, supplies and overhead related to establishing, monitoring, and reviewing certified Service-Disabled Veteran-Owned Business Enterprise programmatic goals for the specific Contract/Agreement.

Questions regarding compliance with SDVOB participation goals should be directed to the Authority's Office of Compliance.

All forms are available at:

For Contractors: thruway.ny.gov/business/contractors/forms/index.html

For Consultants: thruway.ny.gov/business/consultants/forms/index.html

For Purchasers: thruway.ny.gov/business/consultants/forms/index.html

EQUAL EMPLOYMENT OPPORTUNITY AND REMOVAL OF INSTITUTIONAL POLICIES OR PRACTICES THAT FAIL TO ADDRESS THE HARASSMENT AND DISCRIMINATION OF INDIVIDUALS

Contractor agrees to comply with all Authority Compliance Requirements and Procedures, in accordance with the terms and conditions of Appendix A – Standard Clauses for New York State Thruway Authority Contracts including Clause 4 – Non-Discrimination Requirements and Clause 11 - Equal Employment Opportunities for Minorities and Women.

Equal Employment Opportunities for minority group members and women ("EEO") and related provisions shall be deemed supplementary to, and not in lieu of, the nondiscrimination provisions required by New York State Executive Law Article 15 (the "Human Rights Law") and other applicable federal, state, and local laws.

In the performance of this Contract/Agreement, Contractor shall demonstrate compliance with the Work Force Diversity Requirements and Procedures Regarding Equal Employment Opportunities for Minority Group Members and Women, pursuant to 5 NYCRR § 143, Executive Order 177, and all other applicable federal, state and local laws, rules and regulations.

The Contractor will be required to submit its written Policy Statement ensuring “Equal Employment Opportunity and Removal of Institutional Policies or Practices That Fail to Address the Harassment and Discrimination of Individuals,” to the Authority within 10 business days after the letting/bid opening.

During the performance of this contract, the Contractor agrees to comply with the Equal Employment Opportunity (EEO) requirements specified herein.

1. DEFINITIONS – As used in these requirements, the following definitions will apply:

A. “Covered Area” means the geographical area described in the solicitation from which this contract resulted or the geographic area within which this contract will be performed.

B. “Authority” means the New York State Thruway Authority.

C. “Executive Director” means the Executive Director of the New York State Thruway Authority, or his/her duly authorized representative.

D. “Office of Compliance” means the Thruway Authority’s Office of Compliance or his/her duly authorized representative.

E. “Employer Identification Number” means the Federal Social Security Number used on the Employer’s Quarterly Federal Tax Return, U.S. Treasury Department form 941.

F. “Minority” includes:

(i) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);

(ii) Hispanic (a person of Mexican, Puerto Rican, Dominican, Cuban, Central or South American descent of either Indian or Hispanic origin, regardless of race;

(iii) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast, Asia, the Indian Subcontinent, or the Pacific Islands); and

(iv) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification. Identification may be made by any suitable authority in the community such as an educational institution, religious organization, or a state agency).

2. NON-DISCRIMINATION CLAUSE

The Contractor will ensure equal employment opportunity by not discriminating against any applicant for employment because of race, color, religion, sex, national origin, age, disability, or marital status, regarding, (among other things) the following: upgrading, demotion, transfer, recruitment, recruitment advertising, layoff, termination, rates of pay or other forms of compensation and selection for training, including apprenticeship.

3. MINORITY AND WOMEN EMPLOYMENT GOALS

The Contractor shall make a good faith effort to ensure equal employment opportunity by taking the affirmative action’s set forth in paragraph 5A through P of these requirements. The Bidder’s/Proposer’s/Contractor’s/Consultant’s/Engineer’s success in achieving or bettering the goals set forth on the contract goals page, shall be a substantial factor in any determination of

whether the Contractor has complied with its obligation to ensure equal employment opportunity in the performance of this Contract/Agreement. The goals are expressed as percentages of the total hours of employment and training that the Contractor should reasonably be able to give to female or minority employees in a certain covered area. The hours of minority and female employment and training must be substantially uniform throughout the length of the Contract/Agreement, and in each trade. These goals were established from materials published by the NYS Department of Economic Development based on appropriate workforce, demographic or other relevant data or labor force developed by the Division of Minority & Women's Business Development utilizing the 1990 Census Data.

4. AFFIRMATIVE ACTION STEPS AND NON-FEDERAL TRAINING REQUIREMENTS

The Contractor shall implement affirmative action steps at least as extensive as the following:

A. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority and female individuals working at such sites or in such facilities.

B. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

C. Maintain a current file of the name, address, and telephone number of each minority and female off-the street applicant and minority or female referral from a union, a recruitment source, or community organization and of the action which was taken with respect to each such individual.

If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union, or if referred, not employed by the Contractor, this shall be documented in writing to the Office of Compliance and noted in the file with the reasons therefore, along with whatever additional actions the Contractor may have taken.

D. Provide immediate written notification to the Office of Compliance when the Contractor has information that the union referral process has impeded the Contractor's efforts to meet its obligation.

E. Develop on-the-job training opportunities and/or participation in training programs which expressly include minorities and women, including upgrading programs and apprenticeships and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the United States Department of Labor, the New York State Department of Labor, or the New York State Thruway Authority and appropriate for utilization on New York State Thruway Authority projects. The Contractor shall provide notice of these programs to the sources compiled under 5B. above. If the Contractor fails to develop or participate in such apprentice or training programs, its failure to meet the goal set forth herein will be presumed to be noncompliance with these requirements.

F. Disseminate the Contractor's equal employment opportunity policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its equal employment opportunity obligations, by including it in any

policy, annual and collective bargaining agreement, by publicizing it in the company newspaper, annual report, and other similar items, by specific review of the policy with all management personnel and with all minority and female at least once a year, and by posting the Contractor's equal employment opportunity policy on bulletin boards accessible to all employees at each location where work under this contract is performed.

G. Review, at least annually, the Contractor's equal employment opportunity policy and affirmative action obligations under this requirement with all employees having any responsibility for hiring, assignment, layoff, termination, or other employment decision, including specific review of these items with on-site supervisory personnel such as superintendents, general forepersons, etc., prior to the initiation of work at any job site.

A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

H. Disseminate the Contractor's equal employment opportunity policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to, and discussing the Contractor's equal employment opportunity policy with, other Contractors and subcontractors with whom the Contractor does or anticipates doing business.

I. Direct its recruitment efforts, both oral and written, to minority, female, and community organizations, to schools with minority and female students, and to minority and female students, and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above describing the openings, screening procedures, and tests to be used in the selection process.

J. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer, and vacation employment to minority and female youth both on the site and in other areas of the Contractor's workforce.

K. State in all solicitations or advertisements for employees placed by or on behalf of the Contractor that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, national origin, age, disability, or marital status.

L. Conduct, at least annually, an inventory and evaluation of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for such opportunities through appropriate training or other similar activities.

M. Ensure that seniority practices, job classifications, work assignments, and other personnel practices do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the equal employment opportunity policy and the Contractor's obligations under this requirement are being carried out.

N. Ensure that all facilities and company activities are non-segregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

O. Send to each labor union or representative of workers with which the Contractor has a collective bargaining agreement or other contract or understanding, a notice advising the said labor union or workers' representative of the Contractor's commitments under this requirement

and post copies of the notice in conspicuous places available to employees and applicants for employment.

P. Conduct a review, at least annually, of all supervisors' adherence to, and performance under, the Contractor's equal employment opportunity policies and affirmative action obligations.

5. CONTRACTOR/CONSULTANT ASSOCIATIONS

Contractor is encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations. The efforts of a contractor association, joint contractor union, contractor community, or other similar group of which the Contractor is a member and participant, may be asserted as fulfilling one or more of its obligations under this requirement provided that the Contractor actively participates in the group, makes every effort to ensure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

6. TRANSFER OF MINORITY OR FEMALE EMPLOYEES

Through implementing the affirmative action's set forth above and the Contractor's other efforts to ensure equal employment opportunity, the Contractor must have made a commitment to employ minorities and women throughout the life of the contract. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be violation of the contract.

7. CREDITING NON-WORKING TRAINING HOURS TOWARD EMPLOYMENT GOALS

In order for the non-working training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the United States Department of Labor, the New York State Department of Labor or the New York State Thruway Authority and appropriate for utilization on the New York State Thruway Authority projects.

8. REQUIRED RECORDS

A. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the Contractor's equal employment opportunity policy is being carried out and to keep records. The records shall include the names, address, telephone number, construction trade, union affiliation, if any, employee identification number when assigned, social security number, race, sex, status (e.g. mechanic, apprentice, trainee, helper or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay and locations at which the work was performed for each employee.

Records shall be maintained in an understandable and retrievable form. To the extent that records kept by the Contractor for other purposes satisfy the requirements of this paragraph, the Contractor need not maintain separate records.

B. Contractor shall submit on a monthly basis “Monthly Workforce Utilization Composite” (Form TA-W1017) to the TPE/EIC for approval and submitted electronically upon approval to Compliance@thruway.ny.gov. The report shall reflect a monthly composite of the total cumulative hours of work for the entire project workforce (including all subcontractors) from the start of the contract through the contract ending date. For the purpose of composite reporting, the employment and training hours for females and minorities shall be calculated separately. Female utilization hours (minority and non-minority) shall be counted towards female utilization and minority female utilization hours shall also be counted towards minority utilization hours.

C. All records required by this Section must be retained for a period of six years following completion of the contract work and shall be available at reasonable times and places for inspection by authorized representatives of the Authority or the Office of Compliance.

9. GOALS NOT TO BE USED TO DISCRIMINATE

The Contractor shall not use the goals or affirmative action requirements to discriminate against any person because of race, color, religion, sex, national origin, age disability, or marital status.

10. AVAILABILITY OF CONTRACTOR’S RECORDS

The Contractor will furnish all information and reports as may be required by the Authority or by rules, regulations and orders incorporated herein by the Authority and will permit access to its books, records and accounts by the Authority’s Office of Compliance for purposes of monitoring and investigating compliance with these requirements and such rules, regulations, orders, procedures and guidelines.

11. ENFORCEMENT

In order to determine whether the Contractor has complied with the requirements, the Authority may proceed by order to show cause, compliance conference, hearing or any other lawful procedure upon due notice in writing to the Contractor. In the event the Authority finds that the Contractor has failed to comply with these requirements, this contract may be canceled, terminated, or suspended in whole or in part or liquidated damages may be imposed in accordance with the procedures authorized in Section 312 of Executive Law 15-A, Section 40 of the Highway Law, provisions of this Contract/Agreement, relevant laws and statutes as deemed appropriate by the Authority, at no cost or liability to the Authority.

In accordance with EO 177 entitled “Prohibiting State Contracts with Entities that Support Discrimination”, provisions of this Contract/Agreement and Section 40 of the Highway Law, the Contractor may be declared ineligible for further New York State government contract or construction contracts, and such other sanctions may be imposed and remedies invoked as deemed appropriate by the Authority by rule, regulation, or order of the Authority, or as otherwise provided by law.

12. CONTRACTOR’S RESPONSIBILITY REGARDING COLLECTIVE BARGAINING AGREEMENT

Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement to refer either minorities or women shall excuse the Contractor’s obligations under these requirements, any rules, regulations, procedures and guidelines promulgated or established pursuant to Executive Order 21.

13. APPLICABILITY TO SUBCONTRACT

As per Section 312 of Executive Law 15-A the Contractor will physically include the document Equal Employment Opportunity Requirements as part of every subcontract or purchase order unless exempted by rules, regulations, or orders of the Director, pursuant to the Executive Order 8, and such requirements shall be binding upon each subcontractor, service provider, or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the Authority may direct as a means of enforcing such provisions, including sanctions for

noncompliance; provided, however that in the event the Contractor becomes involved in or is threatened with litigation by a subcontractor or vendor as a result of any provision or direction issued pursuant to these requirements or by the Authority, the Contractor may request the State of New York to enter into such litigation or dispute to protect the interests of the State of New York.

14. EQUAL EMPLOYMENT OPPORTUNITY OFFICER

The Contractor will designate and make known to the Office of Compliance who will have the responsibility for and must be capable of effectively administering and promoting an active Contractor program of equal employment opportunity and who must be assigned adequate authority and responsibility to do so.

15. COMPLAINTS OF ALLEGED DISCRIMINATION/SEXUAL HARASSMENT

The Contractor will promptly investigate all complaints of alleged discrimination/sexual harassment made to the Contractor in connection with his/her obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination/sexual harassment may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the Contractor will inform every complainant of all of his or her avenues of appeal, including the New York State Division of Human Rights and Equal Employment Opportunity Commission.

The Contractor shall inform the Office of Compliance (within 24 hours) in writing of any formal or informal complaint, incident or any issue of discrimination/sexual harassment. Results of investigation must be submitted to the Office of Compliance within ten (10) days of the complaint.

TRAINING SPECIAL PROVISIONS

TA-1041 – Training Report

TA-1046 – Monthly Training Report

This work shall consist of the employment and meaningful and effective training of minority and women in New York State Thruway Authority approved training programs leading to their qualification as journeyworkers in the skilled trades required in highway construction. This Training/Special Provision supplements the Equal Employment Opportunity requirements included elsewhere in this Proposal entitled “Equal Employment Opportunity (EEO) Requirements”. Each of the foregoing prescribed specific percentage goals for utilization of minorities and women in the performance of work for the geographic location of the contract.

GENERAL: The primary objective of this Training/Special Provision is to provide training opportunities to minorities and women in construction trades for two purposes:

1. To maintain a pool of qualified minorities and women to replace those journeyworkers who, in the natural course of events, will leave the workforce; and
2. To provide minorities and women as indentured apprentices or trainees in those geographic areas where shortages in minorities and women journeyworkers are recognized because of the Contractor's inability to meet the EEO goals set forth in this contract.

Each contract which contains this Training/Special Provision shall require the training of at least one minority or woman indentured apprentice or trainee. Such individual shall be approved by the Authority. Other than this initial training obligation, to be undertaken and provided by the Contractor, no additional training obligations will exist under this Training/Special Provision unless the goals for minority and women employment and training in the skilled workforce are not continuously met on the contract and generally distributed amongst the trades. In the five counties of New York City, the goals specified for each trade are applicable and must be met. Whenever the goals are not met, additional minorities and/or women indentured apprentices and/or trainees will be assigned or approved in numbers necessary to meet the goals. Data necessary to determine if goals are being met will be provided on Contractor and Subcontractor Employment Utilization Reports (Form TA-1017-9). The data will be verified by the visual observance of the Project Engineer, or designated project inspectors, and hours of employment reported on Contractor or Subcontractor certified weekly payrolls.

The number of minorities and women indentured apprentices and trainees required to be trained under this item shall not exceed 12% of the total journeyworker workforce on the contract, i.e. no more than 1 in 8 of the skilled workforce is required to be a minority or woman indentured apprentice or trainee. This limitation applies regardless of minority and women representation in the trades. However, this limit on required training in no way absolves the Contractor of the responsibility to comply with the EEO requirements.

PRE-AWARD MEETING: Before the Contractor will be allowed to begin work, the Contractor shall attend a Pre-award Meeting and shall submit for Authority use and acceptance, a Workforce and Training Utilization Schedule (Form TA-1024) which shall be correlated to the Contractor's contract work schedule. The Schedule shall include at least the following information:

1. A work schedule for the entire contract,
2. An estimate of the work force required to conform to the work schedule on a monthly basis including an estimate of the workforce in each trade and/or work classification projected to be used including Subcontractors,
3. Separate estimates of the number of minorities and women indentured apprentices or trainees that would be required in each skilled trade to meet the contract EEO employment goals for that trade assuming no minorities or women journeyworkers in the workforce,
4. The proposed training programs to be used and the starting dates for training in each trade and/or work classification,
5. An estimate of the availability of minorities and women journeyworkers in numbers sufficient to meet the EEO contract goals, and

6. Any proposal by the Contractor to use trainees or indentured apprentices to make up for anticipated EEO goal shortfalls. Such proposals shall include the name and craft of any individual proposed by the Contractor as the required trainee or indentured apprentice. In the case of an indentured apprentice, evidence of indentureship and registration of the approved apprenticeship program must be included.

No contract work may be undertaken until the Authority has accepted the Workforce and Training Utilization Schedule. The Contractor shall submit a revised Workforce and Training Utilization Schedule at such times as major changes in the contract work schedule occur which substantially affect the previously submitted schedule.

RECRUITMENT: Although the training requirements of this Training/Special Provision are not intended, and shall not be used to discriminate against any applicant for training, whether a member of a protected class or not, it is recognized that non-minority males have traditionally been and continue to be trained, either formally or on-the-job in an informal manner, for work in the trades utilized in construction work. Therefore, until such time that representative numbers of minorities and women complete training and their utilization as journeyworkers is demonstrated to the extent of the participation goals as set forth in the Authority's construction contract, training required under this Training/Special Provisions will be primarily limited to minorities and women.

Thus, the Contractor shall demonstrate compliance with the intent of this Training/Special Provision by affording the Authority the opportunity to:

1. First, approve the use of a minority or woman indentured apprentice known to the Contractor through an existing Joint Apprenticeship Training program, or
2. Second, provide a partially trained minority or woman trainee who is currently enrolled in a New York State Department of Labor approved training program, or
3. Third, work cooperatively with the Contractor in recruitment of new minorities or women trainees, when needed.

In conformance with the foregoing, the Authority's Form TA-1018 (Request for Personnel), should be submitted to the TPE/EIC for submission to the Authority's Office of Compliance. The Contractor shall allow reasonable time for the Authority's Office of Compliance to ensure on-the-job orientation for approved apprentices or assigned trainees within their first month of employment.

WORK HISTORY: No individual shall be employed as a trainee in any trade and/or work classification in which such person has successfully completed a training course providing journeyworker status in the same trade or work classification, or in which such person has been gainfully employed as a journeyworker by virtue of informal on-the-job training. Detection of individuals in the above categories may be accomplished by including appropriate questions on employee application forms, inquiries to the Authority's Office of Compliance, checking personal references, or by other suitable means. Regardless of the method used, the Contractor shall document the finding for each indentured apprentice or trainee provided training under this requirement. A copy of the finding shall be given to the Authority's Office of Compliance. In the case of indentured apprentices, evidence of indentureship in a registered approved apprenticeship program shall also be submitted.

SUBCONTRACTING: In the event the Contractor subcontracts a portion of the contract work, the Contractor shall ensure the requirements of this Training/Special Provision are physically incorporated in such subcontracts to ensure the workforce utilization by the Subcontractor meets the goals for minorities and women employment and training, either independently or in combination with the prime Contractor's workforce. The Contractor must determine the hours of training, if any, and in which trade or work classification, minorities or women indentured apprentices or trainees are to be trained by the Subcontractor(s). However, the Contractor shall retain the primary responsibility for meeting the training requirements of this Training/Special Provision. Subcontractors are herewith advised that disregard of these requirements may result in the Authority either rescinding approval for work on this contract or disapproving their use on subsequent Authority contracts.

TRAINING PROGRAMS: The minimum length, type of training, and rate of pay for the trade or the work classification of the trade will be specified in the training program approved or sanctioned by the New York State Department of Labor.

Where training is to be provided under this Training/Special Provision, the Contractor shall obtain acceptance and/or approval of the training program to be used, and the starting time for training, prior to commencing training. The Contractor shall provide on-the-job training directed toward developing journeyworkers in the trade, or work classification(s) of the trade involved. To the extent the work involved on the contract permits, such training should include all phases and facets of a trade, or work classification of a trade, to satisfy usual construction industry requirements for continued or future employment therein.

It is the intent of this Training/Special Provision that training will be provided in construction trades rather than clerical type positions. Training may be permitted, in unique circumstances, in lower level management positions such as office engineers, where the training is oriented toward construction related activities. Some off-site training is permissible as long as the training is an integral part of an approved training program and does not comprise a significant part of an overall training program. Both off-site and lower level management training are subject to the Authority's approval.

TRAINEE WAGES: An employee on any New York State Public Works Contract must be paid the full journeyworker prevailing wage unless such employee is individually registered in an approved and registered New York State Department of Labor Apprenticeship Program. It is the responsibility of the Contractor to ascertain the status of any employee utilized to satisfy the trainee requirements under this contract, and to ensure that all New York State Department of Labor apprenticeship requirements are met.

Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyworker wage rate on the wage determination which provides for less than full benefits for apprentices.

DURATION OF TRAINING: Once an indentured apprentice is approved or a trainee is assigned to the contract under the Training/Special Provision, that individual shall be trained in the designed trade throughout the duration of the contract whenever such trade is in use on the

contract until the trainee or apprentice has completed the approved training program. Where training is provided under a multiphase apprenticeship or training program, it is expected that training will be provided continually through all phases to the extent that opportunities for such training exist in the work under contract. Upon satisfactory completion of a phase of training under a multiphase training program, if further appropriate and required training is not available and work in the work classification of the completed phase is available, the minority or woman indentured apprentice or trainee shall continue employment, and be compensated at the prevailing journeyworker wage rate for such work. Hours of employment as a journeyworker described above will not be credited toward training hours required by the approved training or apprenticeship program.

If an indentured apprentice or trainee is terminated before completion of the contract for any reason other than seasonal lay-off or completion of work in that trade, the Contractor shall hold a counseling session with the Authority's Chief Compliance Officer and the individual to explain the reasons for termination. Documentation that the counseling session was held and the reasons for termination shall be given to the Authority's Chief Compliance Officer.

REQUIRED RECORDS: The Contractor shall provide each minority or woman trained under this provision with a certification showing the type and length of training satisfactorily completed. In addition, the Contractor shall keep records on the job site indicating the nature and hours of training provided to each trainee or indentured apprentice and furnish weekly reports documenting performance under this Training/Special Provision to the Project Engineer. No measurement will be made of training provided to indentured apprentices or trainees for whom no work history has been provided to the Project Engineer. In addition, no measurement will be made of training provided to apprentices for whom no evidence of indentureship in a registered apprenticeship program has been provided to the Project Engineer.

NO PAYMENT FOR TRAINING: No payment will be made for the training required of the Contractor under this Training/Special Provision. The required training is a labor cost which is included in the lump sum bid by the Contractor for the items of work comprising the contract.

(1) Journeyworker means a person who is capable of performing all the duties within a trade or a given work classification of a trade.

WORKFORCE UTILIZATION/GROSS WAGES REPORTING

In accordance with the requirements pursuant to Executive Order (EO) 162, Contractors must report employee workforce utilization on a monthly basis and gross wages on a quarterly basis for its company and all subcontractors in accordance with EO 162, as follows:

A. EO 162 (Monthly/Quarterly) Workforce Utilization/Gross Wages Reporting

Construction Contractors/Subcontractors are required to submit (Monthly) Workforce Utilization and (Quarterly) Workforce Utilization/Gross Wages Reports for their firm and all subcontractors.

(Monthly) Workforce Utilization/ (Quarterly) Gross Wages Reports are required to be electronically submitted to WorkforceUtilizationReportConstruction@thruway.ny.gov.

(Monthly) Workforce Utilization report for the preceding month must be submitted by the 10th of each month, for the Contractor and all subcontractors.

The (Monthly) EO 162 Workforce Utilization/Gross Wages Reporting are located on the Thruway website @ thruway.ny.gov/business/dmwbe/eo-162-monthly-construction.xls

(Quarterly) - Workforce Utilization, including Gross Wages Reports for quarterly reporting must be submitted by 10th of April, July, October and January, for the Contractor and all subcontractors.

The (Quarterly) EO 162 Workforce Utilization/Gross Wages Reporting are located on the Thruway website @ thruway.ny.gov/business/dmwbe/eo-162-quarterly-construction.xls

B. Form TA-1017 Monthly Workforce Utilization Composite Report

Form TA-1017 (Monthly) Workforce Utilization Composite report must be completed for each calendar month by the Contractor reflecting the cumulative total work hours of employment to date for the entire workforce.

Form TA-1017 (Monthly) - Workforce Utilization Composite Report, must be approved by the TPE/EIC and electronically submitted prior to the 10th of the month to Compliance@thruway.ny.gov.

Form TA-1017 (Monthly) - Workforce Utilization Composite Report is located on the Thruway website @ thruway.ny.gov/business/dmwbe/ta-w1017.xls

NONDISCRIMINATION

The Contractor shall comply with the provisions of the Human Rights Law, and all other state and federal statutory and constitutional non-discrimination provisions. The Contractor and its subcontractors shall not discriminate against any employee or applicant for employment because of race, creed (religion), color, sex, national origin, sexual orientation, military status, age, disability, predisposing genetic characteristic, marital status or domestic violence victim status, and shall also follow the requirements of the Human Rights Law with regard to non-discrimination on the basis of prior criminal conviction and prior arrest.

Questions regarding compliance with Workforce Utilization/Gross Wages Reporting should be directed to the Authority's Office of Compliance.

MOBILIZATION AND PAYMENT OF ESTIMATES/INVOICES

Processing of mobilization, estimates and/or invoices is contingent upon Contractor demonstration and/or documentation of compliance with **all** of the Authority's Disadvantaged Business/Equal Employment Opportunity/Minority/Women and Service-Disabled Veteran Owned-Business Enterprise Contract/Agreement requirements and provisions.

Forms listed herein may be revised, updated, at the Authority's sole discretion and are required during the covered period, under the reporting schedules established by the Authority.

DBE/EEO/MWBE/SDVOB forms, requirements and reporting schedules will be discussed during the pre-award meeting or by contacting the Authority's Office of Compliance.

REPORTING AND SUBMISSION SCHEDULES

Contractors are required to submit the following forms or reports by the 10th of each month, for the preceding month's activities to: Compliance@thruway.ny.gov

TA-W1017 Monthly Workforce Utilization Composite
TA-W1023 Payments to D/M/WBE Subcontracting Firms
TA-1024 Workforce and Training Utilization Schedule
TA-W1046-9 Weekly Training Progress Report

The above forms or reports must accurately reflect the information reported on the following forms:

TA-W1022-9 Utilization Plan
TA-W1024-9 Workforce and Training Utilization Schedule
TA-W1041-9 Training Report
TA-W1064-9 Construction Contractors Annual EEO Report

Contractors are also required to submit the following forms or reports by the 10th of each month, for the preceding month's activities to:

WorkforceUtilizationReportConstruction@thruway.ny.gov

EO 162 - Monthly Workforce Utilization/Gross Wage Report
EO 162 - Workforce Utilization/Quarterly Gross Wage Report

All Authority Forms are available at:

<http://www.thruway.ny.gov/business/contractors/forms/index.html>

Timely, complete and accurate reports shall be submitted as required and/or upon request.

STATE WAGE RATE INFORMATION

WAGE RATES

The New York State Thruway Authority does not represent or warrant that the accompanying schedule of wages with the classification of workmen, mechanics and laborers, as required by Section 220 of the Labor Law, is complete and it reserves the right to revise such schedule when required.

In the event that revisions are made before the letting date, an amendment will be issued by the Department of purchasers of plans. In the event that the current wage rate schedule should expire before the contract for this project becomes effective the said wage rate schedule will be recertified and the Contractor will be bound by such revised schedule as recertified.

Labor classifications not appearing on this rate sheet can be used only with the consent of the Chief Engineer of the Authority and then the rate to be paid will be given by the Chief Engineer of the Authority after consulting with the State Department of Labor.

All requests for minimum wage rates for additional occupations shall be directed through the Chief Engineer, Thruway Authority.

By legislation effective August 9, 1975, if the prevailing rate of wages or the prevailing practices for supplements as determined by the State Labor Department changes after the contract is let, the Thruway Authority shall request of the State Labor Department a redetermination of the schedules of wages and supplements and such revised wage rates and supplements shall be annexed to and form a part of the contract for the work. The prevailing wage rates and supplemental benefits to be paid are those in effect at the time the work is being performed. The bidder shall take into account in his bid prices all changes in wage rates and supplements that may be forthcoming during the time the contract is in force.

The bidder shall take into account in his bid prices all changes in wage rates and supplements that may be forthcoming during the time the contract is in force.

Pursuant to Section 220-A of the New York State Labor law, the prime Contractor must provide each approved subcontractor with a copy of the schedule of wages and any supplements as specified in this Contract.

The prime Contractor must immediately obtain from each approved subcontractor a certification (TA-44105) of their receipt of, and agreement to pay the applicable prevailing wages as specified in this contract. The prime Contractor shall retain all Subcontractor certifications and provide these certifications to the Authority prior to the processing of the final payment.

The prime Contractor must submit an affidavit (TA-44115) verifying the proper payment of wages to its own employees prior to the processing of the final payment. All completed certifications and affidavits must be originals and be properly signed and notarized.

SPECIAL NOTICE TO BIDDERS IN RELATION TO OVERTIME DISPENSATION

All bidders, in submitting their bids, should base their bids and work progression on the assumption that Overtime Dispensation pursuant to Article 8 of the New York State Labor Law, for any workmen, laborers and mechanics to work more than 8 hours in any one calendar day or more than five days in any one week will not be granted for any operation for the contract duration. Subsequent to award, where the contract documents have imposed specific scheduling and/or phasing requirements or where it is determined by the Authority to be in the best interest of the public, the Authority may process, for approval by the New York State Department of Labor, requests for Overtime Dispensation on certain specific operations and, in the event approval is granted, there shall be no adjustments therefore in any bid prices.

SPECIAL NOTE STATE PREVAILING WAGE RATES

The Contractor shall ensure that workers are paid the appropriate wages and supplemental (fringe) benefits. Throughout the contract, the Contractor shall obtain and pay workers in accordance with periodic wage rate schedule updates from the NYS Department of Labor (NYSDOL). Wage rate amendments and supplements are available on the NYSDOL web site at <https://dol.ny.gov/bureau-public-work-and-prevailing-wage-enforcement>. All changes or clarification of labor classification(s) and applicability of prevailing wage rates shall be obtained in writing from the Office of the Director, NYSDOL Bureau of Public Work.

The NYSDOL prevailing wage rate schedule for this contract has been determined and is available on the internet. The prevailing wage rate schedule is accessed by visiting the NYSDOL web site, navigating to the appropriate web page, and entering the Prevailing Rate Case No. (PRC#). The PRC# is provided on NYSDOL Form PW-200 included in this contract Proposal.

A copy of the project specific prevailing wage rate schedule will be provided to the successful bidder upon award of the contract. Upon written request, the schedule will be provided by the Thruway Authority to prospective bidders without internet access.

The Thruway Authority is providing information regarding the new Public Work Contractor and Subcontractor Registry requirement recently enacted by New York State.

Starting December 30, 2024, all contractors and subcontractors submitting bids or performing construction work on public work projects or private projects covered by [Article 8 of the Labor Law](#) are required to register with the New York State Department of Labor (NYSDOL) under [Labor Law Section 220-i](#).

Private projects subject to Article 8 of the Labor Law include those covered by Labor Law Sections 224-a (public subsidy funded projects), 224-d (renewable energy systems), 224-e (broadband projects), 224-f (climate risk-related and energy transition projects and roadway excavations.)

The law defines a “contractor” as any entity entering into a contract to perform construction, demolition, reconstruction, excavation, rehabilitation, repair, installation, renovation, alteration or custom fabrication. The law defines “subcontractor” as any entity subcontracting with a contractor to perform construction, demolition, reconstruction, excavation, rehabilitation, repair, installation, renovation, alteration or custom fabrication, which is subject to Article 8 of the Labor Law. Contractors are responsible for verifying that any subcontractors they work with are registered.

Contractors need to register before submitting any new bids or commencing new work on a covered project on or after December 30, 2024. Subcontractors also need to register before commencing new work on a covered project on or after December 30, 2024. The Thruway Authority encourages all contractors and subcontractors to register as soon as possible and obtain a Certificate of Registration to avoid negatively impacting a bidding period or project schedule.

Information required to register from the New York State Department of Labor's website for this process can be found here: <https://dol.ny.gov/contractor-and-subcontractor-landing>. For any further questions you can also contact the Bureau of Public Work and Prevailing Wage at 518-457-5589.



Kathy Hochul, Governor

Roberta Reardon, Commissioner

NYS Thruway Authority

John McCool, Construction Specialist 1
200 Southern Blvd.
Albany NY 12209

Schedule Year 2025 through 2026
Date Requested 03/23/2026
PRC# 2026007994

Location MP N9.1
Project ID# D215077
Project Type Niagara Section Pumpouse Upgrade on I-190

PREVAILING WAGE SCHEDULE FOR ARTICLE 8 PUBLIC WORK PROJECT

Attached is the current schedule(s) of the prevailing wage rates and prevailing hourly supplements for the project referenced above. A unique Prevailing Rate Case Number (PRC#) has been assigned to the schedule(s) for your project.

The schedule is effective from July 2025 through June 2026. All updates, corrections, posted on the 1st business day of each month, and future copies of the annual determination are available on the Department's website www.labor.ny.gov. Updated PDF copies of your schedule can be accessed by entering your assigned PRC# at the proper location on the website.

It is the responsibility of the contracting agency or its agent to annex and make part, the attached schedule, to the specifications for this project, when it is advertised for bids and /or to forward said schedules to the successful bidder(s), immediately upon receipt, in order to insure the proper payment of wages.

Please refer to the "General Provisions of Laws Covering Workers on Public Work Contracts" provided with this schedule, for the specific details relating to other responsibilities of the Department of Jurisdiction.

Upon completion or cancellation of this project, enter the required information and mail **OR** fax this form to the office shown at the bottom of this notice, **OR** fill out the electronic version via the NYSDOL website.

NOTICE OF COMPLETION / CANCELLATION OF PROJECT

Date Completed: _____ Date Cancelled: _____

Name & Title of Representative: _____

Phone: (518) 457-5589 Fax: (518) 485-1870
W. Averell Harriman State Office Campus, Bldg. 12, Room 130, Albany, NY 12240

General Provisions of Laws Covering Workers on Article 8 Public Work Contracts

Introduction

The Labor Law requires public work contractors and subcontractors to pay laborers, workers, or mechanics employed in the performance of a public work contract not less than the prevailing rate of wage and supplements (fringe benefits) in the locality where the work is performed.

Contractor Registry

Effective December 30, 2024 all contractors and subcontractors submitting bids or performing construction work on public work projects, or private projects covered by Article 8 of the Labor Law, are required to register with the New York State Department of Labor (NYSDOL) under Labor Law Section 220-i. To register, contractors and subcontractors must submit an application through NYSDOL's Contractor Registry portal which is available through the agency's Management System for Protecting Worker Rights (MPWR) <https://mpwr-public.labor.ny.gov/en/login>.

For additional information, please visit [online](#).

Responsibilities of the Department of Jurisdiction

A Department of Jurisdiction (Contracting Agency) includes a state department, agency, board or commission; a county, city, town or village; a school district, board of education or board of cooperative educational services; a sewer, water, fire, improvement and other district corporation; a public benefit corporation; and a public authority awarding a public work contract.

The Department of Jurisdiction (Contracting Agency) awarding a public work contract MUST obtain a Prevailing Rate Schedule listing the hourly rates of wages and supplements due the workers to be employed on a public work project. This schedule may be obtained by completing and forwarding a "Request for wage and Supplement Information" form (PW 39) to the Bureau of Public Work. The Prevailing Rate Schedule MUST be included in the specifications for the contract to be awarded and is deemed part of the public work contract.

Upon the awarding of the contract, the law requires that the Department of Jurisdiction (Contracting Agency) furnish the following information to the Bureau: the name and address of the contractor, the date the contract was let and the approximate dollar value of the contract. To facilitate compliance with this provision of the Labor Law, a copy of the Department's "Notice of Contract Award" form (PW 16) is provided with the original Prevailing Rate Schedule.

The Department of Jurisdiction (Contracting Agency) is required to notify the Bureau of the completion or cancellation of any public work project. The Department's PW 200 form is provided for that purpose.

Both the PW 16 and PW 200 forms are available for completion [online](#).

Hours

No laborer, worker, or mechanic in the employ of a contractor or subcontractor engaged in the performance of any public work project shall be permitted to work more than eight hours in any day or more than five days in any week, except in cases of extraordinary emergency. The contractor and the Department of Jurisdiction (Contracting Agency) may apply to the Bureau of Public Work for a dispensation permitting workers to work additional hours or days per week on a particular public work project.

Wages and Supplements

The wages and supplements to be paid and/or provided to laborers, workers, and mechanics employed on a public work project shall be not less than those listed in the current Prevailing Rate Schedule for the locality where the work is performed. If a prime contractor on a public work project has not been provided with a Prevailing Rate Schedule, the contractor must notify the Department of Jurisdiction (Contracting Agency) who in turn must request an original Prevailing Rate Schedule form the Bureau of Public Work. Requests may be submitted by: mail to NYSDOL, Bureau of Public Work, State Office Bldg. Campus, Bldg. 12, Rm. 130, Albany, NY 12226; Fax to Bureau of Public Work (518) 485-1870; or electronically at the NYSDOL website www.labor.ny.gov.

Upon receiving the original schedule, the Department of Jurisdiction (Contracting Agency) is REQUIRED to provide complete copies to all prime contractors who in turn MUST, by law, provide copies of all applicable county schedules to each subcontractor and obtain from each subcontractor, an affidavit certifying such schedules were received. If the original schedule expired, the contractor may obtain a copy of the new annual determination from the NYSDOL website www.labor.ny.gov.

The Commissioner of Labor makes an annual determination of the prevailing rates. This determination is in effect from July 1st through June 30th of the following year. The annual determination is available on the NYSDOL website

Payrolls and Payroll Records

Every contractor and subcontractor **MUST** keep original payrolls or transcripts subscribed and affirmed as true under penalty of perjury. As per Article 6 of the Labor law, contractors and subcontractors are required to establish, maintain, and preserve for not less than six (6) years, contemporaneous, true, and accurate payroll records. At a minimum, payrolls must show the following information for each person employed on a public work project: Name, Address, Last 4 Digits of Social Security Number, Classification(s) in which the worker was employed, Hourly wage rate(s) paid, Supplements paid or provided, and Daily and weekly number of hours worked in each classification.

The filing of payrolls to the Department of Jurisdiction is a condition of payment. Every contractor and subcontractor shall submit to the Department of Jurisdiction (Contracting Agency), within thirty (30) days after issuance of its first payroll and every thirty (30) days thereafter, a transcript of the original payrolls, subscribed and affirmed as true under penalty of perjury. The Department of Jurisdiction (Contracting Agency) shall collect, review for facial validity, and maintain such payrolls.

In addition, the Commissioner of Labor may require contractors to furnish, with ten (10) days of a request, payroll records sworn to as their validity and accuracy for public work and private work. Payroll records include, but are not limited to time cards, work description sheets, proof that supplements were provided, cancelled payroll checks and payrolls. Failure to provide the requested information within the allotted ten (10) days will result in the withholding of up to 25% of the contract, not to exceed \$100,000.00. If the contractor or subcontractor does not maintain a place of business in New York State and the amount of the contract exceeds \$25,000.00, payroll records and certifications must be kept on the project worksite.

The prime contractor is responsible for any underpayments of prevailing wages or supplements by any subcontractor.

All contractors or their subcontractors shall provide to their subcontractors a copy of the Prevailing Rate Schedule specified in the public work contract as well as any subsequently issued schedules. A failure to provide these schedules by a contractor or subcontractor is a violation of Article 8, Section 220-a of the Labor Law.

All subcontractors engaged by a public work project contractor or its subcontractor, upon receipt of the original schedule and any subsequently issued schedules, shall provide to such contractor a verified statement attesting that the subcontractor has received the Prevailing Rate Schedule and will pay or provide the applicable rates of wages and supplements specified therein. (See NYS Labor Laws, Article 8 . Section 220-a).

Determination of Prevailing Wage and Supplement Rate Updates Applicable to All Counties

The wages and supplements contained in the annual determination become effective July 1st whether or not the new determination has been received by a given contractor. Care should be taken to review the rates for obvious errors. Any corrections should be brought to the Department's attention immediately. It is the responsibility of the public work contractor to use the proper rates. If there is a question on the proper classification to be used, please call the district office located nearest the project. Any errors in the annual determination will be corrected and posted to the NYSDOL website on the first business day of each month. Contractors are responsible for paying these updated rates as well, retroactive to July 1st.

When you review the schedule for a particular occupation, your attention should be directed to the dates above the column of rates. These are the dates for which a given set of rates is effective. To the extent possible, the Department posts rates in its possession that cover periods of time beyond the July 1st to June 30th time frame covered by a particular annual determination. Rates that extend beyond that instant time period are informational **ONLY** and may be updated in future annual determinations that actually cover the then appropriate July 1st to June 30th time period.

Withholding of Payments

When a complaint is filed with the Commissioner of Labor alleging the failure of a contractor or subcontractor to pay or provide the prevailing wages or supplements, or when the Commissioner of Labor believes that unpaid wages or supplements may be due, payments on the public work contract shall be withheld from the prime contractor in a sufficient amount to satisfy the alleged unpaid wages and supplements, including interest and civil penalty, pending a final determination.

When the Bureau of Public Work finds that a contractor or subcontractor on a public work project failed to pay or provide the requisite prevailing wages or supplements, the Bureau is authorized by Sections 220-b and 235.2 of the Labor Law to so notify the financial officer of the Department of Jurisdiction (Contracting Agency) that awarded the public work contract. Such officer **MUST** then withhold or cause to be withheld from any payment due the prime contractor on account of such contract the amount indicated by the Bureau as sufficient to satisfy the unpaid wages and supplements, including interest and any civil penalty that may be assessed by the Commissioner of Labor. The withholding continues until there is a final determination of the underpayment by the Commissioner of Labor or by the court in the event a legal proceeding is instituted for review of the determination of the Commissioner of Labor.

The Department of Jurisdiction (Contracting Agency) shall comply with this order of the Commissioner of Labor or of the court with respect to the release of the funds so withheld.

Summary of Notice Posting Requirements

The current Prevailing Rate Schedule must be posted in a prominent and accessible place on the site of the public work project. The prevailing wage schedule must be encased in, or constructed of, materials capable of withstanding adverse weather conditions and be titled "PREVAILING RATE OF WAGES" in letters no smaller than two (2) inches by two (2) inches.

The "[Public Work Project](#)" notice must be posted at the beginning of the performance of every public work contract, on each job site.

Every employer providing workers' compensation insurance and disability benefits must post notices of such coverage in the format prescribed by the Workers' Compensation Board in a conspicuous place on the jobsite.

Every employer subject to the NYS Human Rights Law must conspicuously post at its offices, places of employment, or employment training centers, notices furnished by the State Division of Human Rights.

Employers liable for contributions under the Unemployment Insurance Law must conspicuously post on the jobsite notices furnished by the NYS Department of Labor.

Apprentices

Employees cannot be paid apprentice rates unless they are individually registered in a program registered with the NYS Commissioner of Labor. The allowable ratio of apprentices to journeymen in any craft classification can be no greater than the statewide building trade ratios promulgated by the Department of Labor and included with the Prevailing Rate Schedule. An employee listed on a payroll as an apprentice who is not registered as above or is performing work outside the classification of work for which the apprentice is indentured, must be paid the prevailing journeyworker's wage rate for the classification of work the employee is actually performing.

NYSDOL Labor Law, Article 8, Section 220-3, require that only apprentices individually registered with the NYS Department of Labor may be paid apprenticeship rates on a public work project. No other Federal or State Agency of office registers apprentices in New York State.

Persons wishing to verify the apprentice registration of any person must do so in writing by mail, to the NYSDOL Office of Employability Development / Apprenticeship Training, State Office Bldg. Campus, Bldg. 12, Albany, NY 12226 or by Fax to NYSDOL Apprenticeship Training (518) 457-7154. All requests for verification must include the name and social security number of the person for whom the information is requested.

The only conclusive proof of individual apprentice registration is written verification from the NYSDOL Apprenticeship Training Albany Central office. Neither Federal nor State Apprenticeship Training offices outside of Albany can provide conclusive registration information.

It should be noted that the existence of a registered apprenticeship program is not conclusive proof that any person is registered in that program. Furthermore, the existence or possession of wallet cards, identification cards, or copies of state forms is not conclusive proof of the registration of any person as an apprentice.

Interest and Penalties

In the event that an underpayment of wages and/or supplements is found:

- Interest shall be assessed at the rate then in effect as prescribed by the Superintendent of Banks pursuant to section 14-a of the Banking Law, per annum from the date of underpayment to the date restitution is made.
- A Civil Penalty may also be assessed, not to exceed 25% of the total of wages, supplements, and interest due.

Debarment

Any contractor or subcontractor and/or its successor shall be ineligible to submit a bid on or be awarded any public work contract or subcontract with any state, municipal corporation or public body for a period of five (5) years when:

- Two (2) willful determinations have been rendered against that contractor or subcontractor and/or its successor within any consecutive six (6) year period.
- There is any willful determination that involves the falsification of payroll records or the kickback of wages or supplements.

Criminal Sanctions

Willful violations of the Prevailing Wage Law (Article 8 of the Labor Law) may be a felony punishable by fine or imprisonment of up to 15 years, or both.

Discrimination

No employee or applicant for employment may be discriminated against on account of age, race, creed, color, national origin, sex, disability or marital status.

No contractor, subcontractor nor any person acting on its behalf, shall by reason of race, creed, color, disability, sex or national origin discriminate against any citizen of the State of New York who is qualified and available to perform the work to which the employment relates (NYS Labor Law, Article 8, Section 220-e(a)).

No contractor, subcontractor, nor any person acting on its behalf, shall in any manner, discriminate against or intimidate any employee on account of race, creed, color, disability, sex, or national origin (NYS Labor Law, Article 8, Section 220-e(b)).

The Human Rights Law also prohibits discrimination in employment because of age, marital status, or religion.

There may be deducted from the amount payable to the contractor under the contract a penalty of \$50.00 for each calendar day during which such person was discriminated against or intimidated in violation of the provision of the contract (NYS Labor Law, Article 8, Section 220-e(c)).

The contract may be cancelled or terminated by the State or municipality. All monies due or to become due thereunder may be forfeited for a second or any subsequent violation of the terms or conditions of the anti-discrimination sections of the contract (NYS Labor Law, Article 8, Section 220-e(d)).

Every employer subject to the New York State Human Rights Law must conspicuously post at its offices, places of employment, or employment training centers notices furnished by the State Division of Human Rights.

Workers' Compensation

In accordance with Section 142 of the State Finance Law, the contractor shall maintain coverage during the life of the contract for the benefit of such employees as required by the provisions of the New York State Workers' Compensation Law.

A contractor who is awarded a public work contract must provide proof of workers' compensation coverage prior to being allowed to begin work.

The insurance policy must be issued by a company authorized to provide workers' compensation coverage in New York State. Proof of coverage must be on form C-105.2 (Certificate of Workers' Compensation Insurance) and must name this agency as a certificate holder.

If New York State coverage is added to an existing out-of-state policy, it can only be added to a policy from a company authorized to write workers' compensation coverage in this state. The coverage must be listed under item 3A of the information page.

The contractor must maintain proof that subcontractors doing work covered under this contract secured and maintained a workers' compensation policy for all employees working in New York State.

Every employer providing worker's compensation insurance and disability benefits must post notices of such coverage in the format prescribed by the Workers' Compensation Board in a conspicuous place on the jobsite.

Unemployment Insurance

Employers liable for contributions under the Unemployment Insurance Law must conspicuously post on the jobsite notices furnished by the New York State Department of Labor.



Kathy Hochul, Governor

Roberta Reardon, Commissioner

NYS Thruway Authority

John McCool, Construction Specialist 1
200 Southern Blvd.
Albany NY 12209

Schedule Year 2025 through 2026
Date Requested 03/23/2026
PRC# 2026007994

Location MP N9.1
Project ID# D215077
Project Type Niagara Section Pumphouse Upgrade on I-190

Notice of Contract Award

New York State Labor Law, Article 8, Section 220.3a requires that certain information regarding the awarding of public work contracts, be furnished to the Commissioner of Labor. One "Notice of Contract Award" (PW 16, which may be photocopied), **MUST** be completed for **EACH** prime contractor on the above referenced project.

Upon notifying the successful bidder(s) of this contract, enter the required information and mail **OR** fax this form to the office shown at the bottom of this notice, **OR** fill out the electronic version via the NYSDOL website.

Contractor Information

All information must be supplied

Federal Employer Identification Number: _____		
Name: _____		
Address: _____ _____		
City: _____	State: _____	Zip: _____
Amount of Contract: \$ _____	Contract Type:	
Approximate Starting Date: ____/____/____	☐ (01) General Construction	
Approximate Completion Date: ____/____/____	☐ (02) Heating/Ventilation	
	☐ (03) Electrical	
	☐ (04) Plumbing	
	☐ (05) Other : _____	

Phone: (518) 457-5589 Fax: (518) 485-1870
W. Averell Harriman State Office Campus, Bldg. 12, Room 130, Albany, NY 12226

Social Security Numbers on Certified Payrolls:

The Department of Labor is cognizant of the concerns of the potential for misuse or inadvertent disclosure of social security numbers. Identity theft is a growing problem and we are sympathetic to contractors' concern regarding inclusion of this information on payrolls if another identifier will suffice.

For these reasons, the substitution of the use of the last four digits of the social security number on certified payrolls submitted to contracting agencies on public work projects is now acceptable to the Department of Labor. This change does not affect the Department's ability to request and receive the entire social security number from employers during its public work/ prevailing wage investigations.

Construction Industry Fair Play Act: Required Posting for Labor Law Article 25-B § 861-d

Construction industry employers must post the "Construction Industry Fair Play Act" notice in a prominent and accessible place on the job site. Failure to post the notice can result in penalties of up to \$1,500 for a first offense and up to \$5,000 for a second offense. The posting is included as part of this wage schedule. Additional copies may be obtained from the NYS DOL website, <https://dol.ny.gov/public-work-and-prevailing-wage>

If you have any questions concerning the Fair Play Act, please call the State Labor Department toll-free at 1-866-435-1499 or email us at: dol.misclassified@labor.ny.gov.

Worker Notification: (Labor Law §220, paragraph a of subdivision 3-a)

Effective June 23, 2020

This provision is an addition to the existing wage rate law, Labor Law §220, paragraph a of subdivision 3-a. It requires contractors and subcontractors to provide written notice to all laborers, workers or mechanics of the *prevailing wage and supplement rate* for their particular job classification *on each pay stub**. It also requires contractors and subcontractors to *post a notice* at the beginning of the performance of every public work contract *on each job site* that includes the telephone number and address for the Department of Labor and a statement informing laborers, workers or mechanics of their right to contact the Department of Labor if he/she is not receiving the proper prevailing rate of wages and/or supplements for his/her job classification. The required notification will be provided with each wage schedule, may be downloaded from our website www.labor.ny.gov or be made available upon request by contacting the Bureau of Public Work at 518-457-5589. *In the event the required information will not fit on the pay stub, an accompanying sheet or attachment of the information will suffice.

(12.20)

**To all State Departments, Agency Heads and Public Benefit Corporations
IMPORTANT NOTICE REGARDING PUBLIC WORK ENFORCEMENT FUND**

Budget Policy & Reporting Manual

B-610

Public Work Enforcement Fund

effective date December 7, 2005

1. Purpose and Scope:

This Item describes the Public Work Enforcement Fund (the Fund, PWEF) and its relevance to State agencies and public benefit corporations engaged in construction or reconstruction contracts, maintenance and repair, and announces the recently-enacted increase to the percentage of the dollar value of such contracts that must be deposited into the Fund. This item also describes the roles of the following entities with respect to the Fund:

- New York State Department of Labor (DOL),
- The Office of the State of Comptroller (OSC), and
- State agencies and public benefit corporations.

2. Background and Statutory References:

DOL uses the Fund to enforce the State's Labor Law as it relates to contracts for construction or reconstruction, maintenance and repair, as defined in subdivision two of Section 220 of the Labor Law. State agencies and public benefit corporations participating in such contracts are required to make payments to the Fund.

Chapter 511 of the Laws of 1995 (as amended by Chapter 513 of the Laws of 1997, Chapter 655 of the Laws of 1999, Chapter 376 of the Laws of 2003 and Chapter 407 of the Laws of 2005) established the Fund.

3. Procedures and Agency Responsibilities:

The Fund is supported by transfers and deposits based on the value of contracts for construction and reconstruction, maintenance and repair, as defined in subdivision two of Section 220 of the Labor Law, into which all State agencies and public benefit corporations enter.

Chapter 407 of the Laws of 2005 increased the amount required to be provided to this fund to .10 of one-percent of the total cost of each such contract, to be calculated at the time agencies or public benefit corporations enter into a new contract or if a contract is amended. The provisions of this bill became effective August 2, 2005.

**To all State Departments, Agency Heads and Public Benefit Corporations
IMPORTANT NOTICE REGARDING PUBLIC WORK ENFORCEMENT FUND**

OSC will report to DOL on all construction-related ("D") contracts approved during the month, including contract amendments, and then DOL will bill agencies the appropriate assessment monthly. An agency may then make a determination if any of the billed contracts are exempt and so note on the bill submitted back to DOL. For any instance where an agency is unsure if a contract is or is not exempt, they can call the Bureau of Public Work at the number noted below for a determination. Payment by check or journal voucher is due to DOL within thirty days from the date of the billing. DOL will verify the amounts and forward them to OSC for processing.

For those contracts which are not approved or administered by the Comptroller, monthly reports and payments for deposit into the Public Work Enforcement Fund must be provided to the Administrative Finance Bureau at the DOL within 30 days of the end of each month or on a payment schedule mutually agreed upon with DOL.

Reports should contain the following information:

- Name and billing address of State agency or public benefit corporation;
- State agency or public benefit corporation contact and phone number;
- Name and address of contractor receiving the award;
- Contract number and effective dates;
- Contract amount and PWEF assessment charge (if contract amount has been amended, reflect increase or decrease to original contract and the adjustment in the PWEF charge); and
- Brief description of the work to be performed under each contract.

Checks and Journal Vouchers, payable to the "New York State Department of Labor" should be sent to:

Department of Labor
Administrative Finance Bureau-PWEF Unit
Building 12, Room 464
State Office Campus
Albany, NY 12226

Any questions regarding billing should be directed to NYSDOL's Administrative Finance Bureau-PWEF Unit at (518) 457-3624 and any questions regarding Public Work Contracts should be directed to the Bureau of Public Work at (518) 457-5589.

Required Notice under Article 25-B of the Labor Law

**Attention All Employees, Contractors and Subcontractors:
You are Covered by the Construction Industry Fair Play Act**

The law says that you are an employee unless:

- You are free from direction and control in performing your job, **and**
- You perform work that is not part of the usual work done by the business that hired you, **and**
- You have an independently established business.

Your employer cannot consider you to be an independent contractor unless all three of these facts apply to your work.

It is against the law for an employer to misclassify employees as independent contractors or pay employees off the books.

Employee Rights: If you are an employee, you are entitled to state and federal worker protections. These include:

- Unemployment Insurance benefits, if you are unemployed through no fault of your own, able to work, and otherwise qualified,
- Workers' compensation benefits for on-the-job injuries,
- Payment for wages earned, minimum wage, and overtime (under certain conditions),
- Prevailing wages on public work projects,
- The provisions of the National Labor Relations Act, and
- A safe work environment.

It is a violation of this law for employers to retaliate against anyone who asserts their rights under the law. Retaliation subjects an employer to civil penalties, a private lawsuit or both.

Independent Contractors: If you are an independent contractor, **you must pay all taxes and Unemployment Insurance contributions required by New York State and Federal Law.**

Penalties for paying workers off the books or improperly treating employees as independent contractors:

- **Civil Penalty**
First offense: Up to \$2,500 per employee
Subsequent offense(s): Up to \$5,000 per employee
- **Criminal Penalty**
First offense: Misdemeanor - up to 30 days in jail, up to a \$25,000 fine and debarment from performing public work for up to one year.
Subsequent offense(s): Misdemeanor - up to 60 days in jail or up to a \$50,000 fine and debarment from performing public work for up to 5 years.

If you have questions about your employment status or believe that your employer may have violated your rights and you want to file a complaint, call the Department of Labor at (866) 435-1499 or send an email to dol.misclassified@labor.ny.gov. All complaints of fraud and violations are taken seriously. You can remain anonymous.

Employer Name:

IA 999 (09/16)

WE ARE YOUR DOLDepartment
of LaborNew York State Department of Labor
Bureau of Public Work

Attention Employees

THIS IS A: **PUBLIC WORK PROJECT**

If you are employed on this project as a **worker, laborer, or mechanic** you are entitled to receive the **prevailing wage and supplements rate** for the classification at which you are working.

Your pay stub and wage notice received upon hire must clearly state your wage rate and supplement rate.

Chapter 629 of the Labor Laws of 2007:

These wages are set by law and must be posted at the work site. They can also be found at:
<https://dol.ny.gov/bureau-public-work>



If you feel that you have not received proper wages or benefits, please call our nearest office.*

Albany	(518) 457-2744	Patchogue	(631) 687-4882
Binghamton	(607) 721-8005	Rochester	(585) 258-4505
Buffalo	(716) 847-7159	Syracuse	(315) 428-4056
Garden City	(516) 228-3915	Utica	(315) 793-2314
New York City	(212) 932-2419	White Plains	(914) 997-9507
Newburgh	(845) 568-5287		

* For New York City government agency construction projects, please contact the Office of the NYC Comptroller at (212) 669-4443, or www.comptroller.nyc.gov – click on Bureau of Labor Law.

Contractor Name: _____

Project Location: _____

Requirements for OSHA 10 Compliance

Article 8 §220-h requires that when the advertised specifications, for every contract for public work, is \$250,000.00 or more the contract must contain a provision requiring that every worker employed in the performance of a public work contract shall be certified as having completed an OSHA 10 safety training course. The clear intent of this provision is to require that all employees of public work contractors, required to be paid prevailing rates, receive such training "prior to the performing any work on the project."

The Bureau will enforce the statute as follows:

All contractors and sub contractors must attach a copy of proof of completion of the OSHA 10 course to the first certified payroll submitted to the contracting agency and on each succeeding payroll where any new or additional employee is first listed.

Proof of completion may include but is not limited to:

- Copies of bona fide course completion card (*Note: Completion cards do not have an expiration date.*)
- Training roster, attendance record or other documentation from the certified trainer pending the issuance of the card.
- Other valid proof

**A certification by the employer attesting that all employees have completed such a course is not sufficient proof that the course has been completed.

Any questions regarding this statute may be directed to the New York State Department of Labor, Bureau of Public Work at 518-457-5589.

Introduction to the Prevailing Rate Schedule

Information About Prevailing Rate Schedule

This information is provided to assist you in the interpretation of particular requirements for each classification of worker contained in the attached Schedule of Prevailing Rates.

Classification

It is the duty of the Commissioner of Labor to make the proper classification of workers taking into account whether the work is heavy and highway, building, sewer and water, tunnel work, or residential, and to make a determination of wages and supplements to be paid or provided. It is the responsibility of the public work contractor to use the proper rate. If there is a question on the proper classification to be used, please call the district office located nearest the project. District office locations and phone numbers are listed below. Prevailing Wage Schedules are issued separately for "General Construction Projects" and "Residential Construction Projects" on a county-by-county basis.

General Construction Rates apply to projects such as: Buildings, Heavy & Highway, and Tunnel and Water & Sewer rates. Residential Construction Rates generally apply to construction, reconstruction, repair, alteration, or demolition of one family, two family, row housing, or rental type units intended for residential use. Some rates listed in the Residential Construction Rate Schedule have a very limited applicability listed along with the rate. Rates for occupations or locations not shown on the residential schedule must be obtained from the General Construction Rate Schedule. Please contact the local Bureau of Public Work office before using Residential Rate Schedules, to ensure that the project meets the required criteria.

*Contractor Registry (LL 220-I): Effective December 30th, 2024

Labor Law Section 220-i(6) prohibits contractors from bidding on public work and prohibits both contractors and subcontractors from commencing work on private and public projects subject to prevailing wage requirements. This section requires contractors to submit their Certificate of Registration with their bid materials. Each Certificate of Registration will have a unique registration number. Failure to provide proof of registration, as required by Labor Law Section 220-i, as a minimum qualification will result in the bidder being deemed non-responsive. There is a public database of registered contractors and subcontractors available online at data.ny.gov to confirm registration validity. For additional information on how to register and the requirements, visit <https://dol.ny.gov/public-work-contractor-and-subcontractor-registry-landing>

*Electronic Certified Payroll (LL 220-J): Effective December 31st, 2025

Effective December 31, 2025, all contractors and subcontractors who perform public work, or covered private work subject to the prevailing wage, will be required to submit certified payrolls electronically to the Bureau of Public Work and Prevailing Wage Enforcement. Additional information about the electronic certified payroll submission system will be made available on the Department's Website at <https://dol.ny.gov/Electronic-Payroll>

Payrolls and Payroll Records

Every contractor and subcontractor MUST keep original payrolls or transcripts subscribed and affirmed as true under penalty of perjury. Payrolls must be maintained for at least three (3) years from the projects date of completion. Additionally, as per Article 6 of the Labor Law, contractors and subcontractors are required to establish, maintain, and preserve for not less than six (6) years, contemporaneous, true, and accurate payroll records.

At a minimum, payrolls must show the following information for each person employed on a public work project: Name; Address, Last 4 Digits of Social Security number, Classification(s) in which the worker was employed, Hourly wage rate(s) paid, Supplements paid or provided, and Daily and weekly number of hours worked in each classification.

Payroll records and transcripts are required to be kept on site during all the time that work under that contract is being performed.

NOTE: For more detailed information regarding Article 9 prevailing wage contracts, please refer to "General Provisions of Laws Covering Workers on Article 9 Public Work Building Service Contracts".

If you have any questions concerning the attached schedule or would like additional information, please write to:

New York State Department of Labor
Bureau of Public Work
State Office Campus, Bldg. 12
Albany, NY 12240

OR

Contact the nearest BUREAU of PUBLIC WORK District Office

District Office Locations:	Telephone #	FAX #
Bureau of Public Work - Albany	518-457-2744	518-485-0240
Bureau of Public Work - Binghamton	607-721-8005	607-721-8004

Bureau of Public Work - Buffalo	716-847-7159	716-847-7650
Bureau of Public Work - Garden City	516-228-3915	516-794-3518
Bureau of Public Work - Newburgh	845-568-5287	845-568-5332
Bureau of Public Work - New York City	212-932-2419	212-775-3579
Bureau of Public Work - Patchogue	631-687-4882	631-687-4902
Bureau of Public Work - Rochester	585-258-4505	585-258-4708
Bureau of Public Work - Syracuse	315-428-4056	315-428-4671
Bureau of Public Work - Utica	315-793-2314	315-793-2514
Bureau of Public Work - White Plains	914-997-9507	914-997-9523
Bureau of Public Work - Central Office	518-457-5589	518-485-1870

Paid Holidays

Paid Holidays are days for which an eligible employee receives a regular day's pay, but is not required to perform work. If an employee works on a day listed as a paid holiday, this remuneration is in addition to payment of the required prevailing rate for the work actually performed.

Overtime

At a minimum, all work performed on a public work project in excess of eight hours in any one day or more than five days in any workweek is overtime. However, the specific overtime requirements for each trade or occupation on a public work project may differ. Specific overtime requirements for each trade or occupation are contained in the prevailing rate schedules.

Overtime holiday pay is the premium pay that is required for work performed on specified holidays. It is only required where the employee actually performs work on such holidays.

The applicable holidays are listed under HOLIDAYS: OVERTIME. The required rate of pay for these covered holidays can be found in the OVERTIME PAY section listings for each classification.

Supplemental Benefits

Particular attention should be given to the supplemental benefit requirements. Although in most cases the payment or provision of supplements is straight time for all hours worked, some classifications require the payment or provision of supplements, or a portion of the supplements, to be paid or provided at a premium rate for premium hours worked. Supplements may also be required to be paid or provided on paid holidays, regardless of whether the day is worked. The Overtime Codes and Notes listed on the particular wage classification will indicate these conditions as required.

Effective Dates

When you review the schedule for a particular occupation, your attention should be directed to the dates above the column of rates. These are the dates for which a given set of rates is effective. The rate listed is valid until the next effective rate change or until the new annual determination which takes effect on July 1 of each year.

All contractors and subcontractors are required to pay the current prevailing rates of wages and supplements. If you have any questions please contact the Bureau of Public Work or visit the New York State Department of Labor website (www.labor.ny.gov) for current wage rate information.

Shift Work

If the timeline of the contract requires shift work be performed to meet deadlines, the BPWE will enforce the shift work rate as the required rate on the project whether or not shift work is specifically addressed in the contract.

Paid Prenatal Leave

Every employer shall be required to provide to its employees twenty hours of paid prenatal personal leave during any fifty-two week calendar period. Paid prenatal personal leave shall mean leave taken for the health care services received by an employee during their pregnancy or related to such pregnancy, including physical examinations, medical procedures, monitoring and testing, and discussions with a healthcare provider related to the pregnancy. Paid prenatal personal leave may be taken in hourly increments. Benefits for paid prenatal personal leave shall be paid in hourly installments. Employees shall receive compensation at the employee's regular rate of pay, or the applicable minimum wage established by the labor law, whichever is greater, for the use of Paid Prenatal leave.

Apprentice Training Ratios

The following are the allowable ratios of registered Apprentices to Journey-workers.

For example, the ratio 1:1,1:3 indicates the allowable initial ratio is one Apprentice to one Journeyworker. The Journeyworker must be in place on the project before an Apprentice is allowed. Then three additional Journeyworkers are needed before a second Apprentice is allowed. The last ratio repeats indefinitely. Therefore, three more Journeyworkers must be present before a third Apprentice can be hired, and so on.

Please call Apprentice Training Central Office at (518) 457-6820 if you have any questions.

Title (Trade)	Ratio
Boilermaker (Construction)	1:1,1:4
Boilermaker (Shop)	1:1,1:3
Carpenter (Bldg.,H&H, Pile Driver/Dockbuilder)	1:1,1:4
Carpenter (Residential)	1:1,1:3
Electrical (Outside) Lineman	1:1,1:2
Electrician (Inside)	1:1,1:3
Elevator/Escalator Construction & Modernizer	1:1,1:2
Glazier	1:1,1:3
Insulation & Asbestos Worker	1:1,1:3
Iron Worker	1:1,1:4
Laborer	1:1,1:3
Mason	1:1,1:4
Millwright	1:1,1:4
Op Engineer	1:1,1:5
Painter	1:1,1:3
Plumber & Steamfitter	1:1,1:3
Roofer	1:1,1:2
Sheet Metal Worker	1:1,1:3
Sprinkler Fitter	1:1,1:2

If you have any questions concerning the attached schedule or would like additional information, please contact the nearest BUREAU of PUBLIC WORK District Office or write to:

New York State Department of Labor
Bureau of Public Work
State Office Campus, Bldg. 12
Albany, NY 12226

District Office Locations:	Telephone #	FAX #
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Bureau of Public Work - Newburgh	845-568-5287	845-568-5332
Bureau of Public Work - New York City	212-932-2419	212-775-3579
Bureau of Public Work - Patchogue	631-687-4882	631-687-4902
Bureau of Public Work - Rochester	585-258-4505	585-258-4708
Bureau of Public Work - Syracuse	315-428-4056	315-428-4671
Bureau of Public Work - Utica	315-793-2314	315-793-2514
Bureau of Public Work - White Plains	914-997-9507	914-997-9523
Bureau of Public Work - Central Office	518-457-5589	518-485-1870

**AGREEMENT,
FAITHFUL
PERFORMANCE
BOND,
AND
LABOR AND
MATERIAL
BOND**

545

CONTRACT NO:

COUNTY:

**NEW YORK STATE
THRUWAY AUTHORITY**

A G R E E M E N T

NEW YORK STATE THRUWAY AUTHORITY

AGREEMENT

CONTRACT NO:

This **AGREEMENT**, entered into this day of _____, by the **NEW YORK STATE THRUWAY AUTHORITY** (hereinafter referred to as the "**AUTHORITY**") having its principal office at 200 Southern Blvd. (P. O. Box 189, Albany, NY 12201) in the County of Albany and State of New York and hereinafter called the "**CONTRACTOR**",

☐ 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

WITNESSETH: That the Authority and the Contractor for the consideration hereinafter named agree as follows:

ARTICLE 1. WORK TO BE DONE.

The Contractor shall (a) furnish all the materials, appliances, tools and labor of every kind required, and construct and complete in the most substantial and skillful manner, the construction, improvement or reconstruction of the project on or before the completion date of the as further described in ARTICLE 4, and as generally identified and shown on the plans entitled:

in accordance with the "Standard Specifications" of the New York State Department of Transportation, which contain the information for bidders; form of proposal, agreement, and bonds; general specifications and conditions or contract; materials of construction; and payment items; and (b) do everything required by the Contract (Contract Documents) as defined herein.

The Contractor agrees that its proposal contained herein is based upon performing all the work of the Contract in accordance with a schedule that will result in the completion of the total works by the Date of Completion of the Contract and all intermediate stage and phase completion requirements of the contract, while adhering to all restrictions set forth in the Schedule and Suspension of Work, the Thruway Traffic Plan, and the General and Special Notes, and that the work will be performed at the unit bid prices, as shown on the contract documents and as detailed in the specifications and notes, utilizing the Labor Force, Qualified Disadvantaged, Women Owned and Minority Owned Subcontractor Entrepreneurs and Methods and Materials of Construction as described in the Contract Documents and any incorporated Addenda thereto, and conduct its operations in accordance with the Vehicle and Traffic Law, the Rules and Regulations of the NYS Thruway Authority, and the Thruway Operating Rules and General and Special Notes that are part of this proposal. The Contractor further agrees its proposal is not based upon the assumption that any specifications, traffic restrictions, scheduling or phasing/staging requirements will be waived, an extension of Contract Completion Date will be granted, a labor dispensation will be granted, substitution of non-approved products, alternatives or claimed functional equivalents for Specified Construction Materials and Methods will be allowed, or any Value Engineering Proposals will be entertained and approved by the New York State Thruway Authority, and any requests for a substitution, equivalent or alternate, which it proposes, will be accompanied by an agreed price analysis establishing an applicable credit or illustrating cost equal to or greater than the bid amount.

ARTICLE 2. DOCUMENTS FORMING THE CONTRACT.

The Contract (and Contract Documents) shall be deemed to include the advertisement for proposals; the contractor's proposal; the Schedule for Participation By Disadvantaged Business Enterprise Participation goals; the agreement; the "Standard Specifications" including all addenda thereto referred to above; the plans; any addenda and/or amendments to specifications if the same are issued prior to date of receipt of proposal and all provisions required by law to be inserted in the contract whether actually inserted or not. Appendix A, standard clauses for all N.Y State contracts, is attached hereto and is hereby made a part of this agreement as if set forth fully herein.

ARTICLE 3. EXAMINATION OF DOCUMENTS AND SITE.

The Contractor agrees that before making its proposal it carefully examined the contract documents, together with the site of the proposed work, as well as its surrounding territory, and is informed regarding all of the conditions affecting the work to be done and labor and materials to be furnished for the completion of this contract, including the existence of poles, wires, pipes, and other facilities and structures of municipal and other public service corporations on, over or under the site, except latent conditions that meet the requirements of §104-04 and §109-05, and that its information was secured by personal investigation and research.

ARTICLE 4. DATE OF COMPLETION.

The Contractor further agrees that it will begin the work herein embraced within ten days of the effective date hereof, unless the consent of the Authority, in writing, is given to begin at a later date, and that it will prosecute the same so that it shall be entirely completed and performed on or before the completion date shown in Article 1.

No extension beyond the date of completion fixed by the terms of this contract shall be effective unless in writing signed by the Authority. Such extension shall be for such time and upon such terms and conditions as shall be fixed by the Authority, which may include the assessment of liquidated damages and a charge for engineering and inspection expenses actually incurred upon the work, including engineering and inspection expenses incurred upon the work by railroad companies on contracts for grade crossing elimination. Notice of application for such extension shall be filed with the Chief Engineer, Department of Engineering of the Authority at least fifteen days prior to the date of completion fixed by the terms of this agreement.

ARTICLE 5. ALTERATIONS AND OMISSIONS.

The said work shall be performed in accordance with the true intent and meaning of the contract documents without any further expense of any nature whatsoever to the Authority other than the consideration named in this agreement.

The Authority 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 Standard Specifications, for this work without constituting grounds for any claim by the contractor for allowance for damages or for loss of anticipated profits, or for any variations between the approximate quantities and the quantities of the work as done.

ARTICLE 6. NO COLLUSION OR FRAUD.

The Contractor hereby agrees that the only person or persons interested as principal or principals in the bid or proposal submitted by the Contractor for this contract are named therein, and that no person other than those mentioned therein has any interest in the above-mentioned proposal or in securing of the award, and that this contract has been secured without any connection with any person or persons other than those named, and that the proposal is in all respects fair and was prepared and the contract was secured without collusion or fraud and that neither any officer nor employee of the New York State Thruway Authority or the State Department of Transportation or either of them has or shall have a financial interest in the performance of the contract or in the supplies, work or business to which it relates, or in any portion of the profits thereof. (See also Section 139-a and 139-b of the State Finance Law referred to in the Standard Specifications, which are made a part of this contract.)

ARTICLE 7. CONTRACT PAYMENTS.

As the work progresses in accordance with the contract and in a manner that is satisfactory to the Authority, the Authority hereby agrees to make payments to the Contractor therefore, based upon the proposal attached hereto and made a part hereof, as follows: The Authority shall, once in each month and on such days as it may fix, make an estimate of the quantity of work done and of material which has actually been put in place in accordance with the terms and conditions of the contract, during the preceding month, and compute the value thereof and pay to the Contractor the moneys due in accordance with Public Authorities Law Section 2880, as detailed in 21 NYCRR Part 109 (Prompt Payment). No monthly estimate shall be rendered unless the Contractor has provided acceptable documentation with regard to actions taken to comply with the M/WBE goals of the contract (see also §109-06 Contract Payments) and the value of the work done equals 5% of the contract amount or \$1,000, whichever is the lesser. Semi-monthly estimates may be rendered provided (a) the value of the work performed in two successive weeks is more than \$100,000 or (b) the Chairman of

the Authority deems it to be for the best interest of the Authority to do so.

Contractor understands and agrees that payments will only be rendered electronically unless payment by paper check is expressly authorized by the Authority, in its sole discretion, due to extenuating circumstances. Contractor shall comply with the Authority's procedures to authorize electronic payments. Authorization forms are available at <http://www.thruway.ny.gov/business/purchasing/epayments/index.html>, by e-mail at suppliermgmt@thruway.ny.gov, or by telephone at (518) 436-2859. Contractor acknowledges that it will not receive payment of any estimates submitted under this Agreement if it does not comply with the Authority's electronic payment procedures, except where the Authority has expressly authorized payment by paper check as set forth above.

ARTICLE 8. PAYMENT DUE TO CONTRACTOR'S NON-COMPLIANCE.

It is further agreed that so long as any lawful or proper direction concerning the work or material given by the Chief Engineer, Department of Engineering of the New York State Thruway Authority, or his/her representative, shall remain uncomplied with, the 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 such lawful or proper direction aforesaid has been fully and satisfactorily complied with.

ARTICLE 9. FINAL ACCEPTANCE OF WORK.

When in the opinion of the Thruway Division Director, a Contractor has fully performed the work under the contract, the Thruway Division Director shall recommend to the Chief Engineer, Department of Engineering of the New York State Thruway Authority, the acceptance of the work so completed. If the Chief Engineer, Department of Engineering accepts the recommendation of the Thruway Division Director, he/she shall thereupon by letter notify the Contractor of such acceptance. Copies of such acceptance shall be sent to other interested parties. Prior to the final acceptance of the work by the Chief Engineer, Department of Engineering of the New York State Thruway Authority or a designee, the contract work may be inspected, accepted and approved by other agencies and/or municipalities who will have jurisdiction of the work after final acceptance.

Final acceptance shall be final and conclusive except for defects not readily ascertainable by the New York State Thruway Authority, actual or constructive, fraud, gross mistakes amounting to fraud or other errors which the Contractor knew or should have known about as well as the New York State Thruway Authority's rights under any warranty or guarantee. Final acceptance may be revoked by the New York State Thruway Authority at any time prior to the issuance of the final check, upon the New York State Thruway Authority's discovery of such defects, mistakes, fraud or errors in the work.

ARTICLE 10. FINAL PAYMENT.

After the final acceptance of the work, the 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 the Engineer. Upon approval of such final agreement by the Director, Office of Construction Management, it shall be submitted to the Chief Engineer,

Department of Engineering for final approval. The right, however, is hereby reserved to the Chief Engineer, Department of Engineering to reject the whole or any portion of the final agreement, should the said certificate of the Engineer be found or known to be inconsistent with the terms of the agreement or otherwise improperly given. 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 11. RIGHT TO SUSPEND WORK AND CANCEL CONTRACT.

Article 11.1 General Right to Suspend and Cancel Contract.

It is further mutually agreed that if at any time during the prosecution of the work the Authority shall determine that the work is not being performed in accordance with the Contract or for the best interest of the Authority, the Chief Engineer, Department of Engineering, may proceed in any of the following ways:

- 1) Temporarily suspend the execution of the work by the Contractor, and the Chief Engineer of the Authority may then proceed with the work under his/her own direction in such manner as will accord with the Contract Documents and be for the best interests of the Authority; or
- 2) Terminate the Contract while it is in progress, and thereupon proceed with the work by a new contract negotiated or publicly advertised, by the use of his/her own forces, by calling upon the Surety to complete the Work in accordance with the Contract Documents, or by a combination of any such methods; or
- 3) Cancel the Contract and re-advertise and re-procure in accordance with applicable law; or
- 4) Complete the Work under the Authority's direction in such a manner as will accord with the Contract Documents and be for the best interests of the Authority.

Any excess in the cost of completing the Contract beyond the Contract Price for which it was originally awarded shall be charged to and paid by the Contractor failing to perform the Work or its Surety, all pursuant to the provisions of Section 40 of the New York State Highway Law.

In the event of suspension or termination, the Contractor shall be paid its costs, including contract close-out costs, and profit on work satisfactorily performed and project design costs actually incurred up to the time of termination, less an amount necessary to satisfy any claims, liens or judgments against the Contractor. The Contractor shall promptly submit its termination claim. The Contractor will only be paid the contract price for materials delivered and accepted, or services performed in accordance with the manner or performance set forth in this contract, less an amount necessary to satisfy any claims, liens or judgments against the Contractor.

Whenever the Authority determines to suspend or stop Work under this Contract, a written notice sent by mail to the Contractor at its address and to its Sureties at their respective addresses shall be sufficient notice of its action in the premises.

Article 11.2 Termination for Cause.

- A. If at any time during the prosecution of the work the Chief Engineer shall determine that the work under the Contract is not being performed according to the Contract or any

provision of the Contract is violated by the Contractor or by any subcontractor or that an Event of Default (as defined below) has occurred hereunder, the Chief Engineer, in his or her sole and absolute discretion, may proceed in any of the following ways:

- (1) Suspend or stop work by the Contractor, and the Chief Engineer may then complete the Work under his/her own direction in such manner as further described in the Contract Documents and as determined by the Chief Engineer to be in the best interests of the Authority; or
- (2) Terminate the Contract while it is in progress, and thereupon complete the work by: a new contract negotiated or publicly advertised; use of the Authority's own forces; calling upon the Surety to complete the Work in accordance with the Contract; or a combination of any such methods; or
- (3) Terminate the Contract and re-advertise as provided in law or if applicable, demand upon the Surety to complete any and all remaining work pursuant to the terms of the Contract and the Faithful Performance Bond.

As used herein, an "Event of Default" shall mean a material breach of the Contract by the Contractor which, without limitation, the following has occurred: (i) the Contractor has failed to begin the work in accordance with the Contract requirements; (ii) performance of this Contract has been unnecessarily or unreasonably delayed, (iii) the Contractor has willfully violated any of the provisions of the Contract or has not executed the same in good faith and in accordance with this Contract; (iv) the Contractor has abandoned the work; (v) the Contractor has become insolvent (other than as a bankrupt), or has assigned the proceeds of this Contract for the benefit of creditors, or taken advantage of any insolvency statute or debtor or creditor law or if his property or affairs have been put in the hands of a receiver; (vi) the Contractor has failed to obtain an approval required by the Contract; (vii) the Contractor has failed to provide the required insurances; (viii) the Contractor has failed to provide "adequate assurance" as required; or (ix) the Contractor is found to be non-responsible.

- B. Any excess in the cost of completing the Contract beyond the price for which it was originally awarded shall be charged to and paid by the Contractor failing to perform the work or by the Contractor's Surety, pursuant to the terms and conditions of Section 40 of the New York State Highway Law and the Faithful Performance Bond.
- C. Whenever the Authority determines to suspend, stop work, or terminate under this provision of the Contract, the Contractor and Surety shall receive written notice specifying the basis for such default (the "Default Notice"). Contractor shall have fifteen (15) days from the date of the Default Notice to cure such default, except that, at Authority's sole discretion, the Authority may extend such fifteen (15) day period for such additional period as the Authority shall deem appropriate without waiver of any of its rights hereunder. The Default Notice shall specify the date the Contractor is to discontinue all work if such default is not timely cured (the "Termination Date"). If the Event of Default is not cured or arrangements satisfactory to the Authority are not made (as evidenced in writing by the Authority) within the designated cure period, then Contractor shall suspend work and/or the Contract shall terminate, as the case may be, upon the Termination Date.

- D. Upon occurrence of an Event of Default or a termination for cause pursuant to this Article, the Authority has the remedies set forth in the Faithful Performance Bond, the Contract, and all remedies at law or in equity.
- E. In the event the termination for cause is determined to be improper, the termination shall be deemed a Termination for Convenience as identified in Article 11.3.

Article 11.3 Termination for Convenience.

- A. The Authority, at any time, may terminate the Contract in whole or in part. Any such termination shall be effected by delivering to the Contractor a written notice of termination specifying the extent to which performance of work under the Contract is terminated and the date upon which the termination becomes effective. Upon receipt of the notice of termination, the Contractor shall act promptly to minimize the expenses resulting from the termination.
- B. The Authority shall pay the Contractor for work of the contract performed by the Contractor and accepted by the Authority for the period extending from the end of the period covered by the last approved Application for Payment up to the effective date of the termination, an amount determined in accordance with the Contract Documents. In no event shall the Contractor be entitled to compensation in excess of the total consideration of the Contract. In no event shall the Contractor be entitled to overhead or profit on the work not performed.
- C. In the event of such termination, the Authority may take over the work and prosecute the Contract to completion and may take possession of and may utilize such materials, appliances, and equipment on the site and necessary or useful in completing the work. The Authority also has the right to suspend the execution of the Work for convenience and/or to terminate the Contract for convenience.

Whenever the New York State Thruway Authority determines to suspend or stop work under the contract, a written notice sent by mail to the Contractor at its address and to the sureties at their respective addresses, shall be sufficient notice of its action in the premises.

Article 11.4 Termination for Vendor Responsibility.

- A. Contractor shall at all times during the Contract term remain responsible. Contractor agrees, if requested by the Authority, 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.
- B. The Authority, in its sole discretion, reserves the right to suspend any or all activities under this Contract, at any time, when it discovers information that calls in to question the responsibility of Contractor. In the event of such suspension, Contractor will be given written notice outlining the particulars of such suspension. Upon issuance of such notice, Contractor shall comply with the terms of the suspension order. Contract activity may resume at such time as the Authority issues a written notice authorizing a resumption of performance under the Contract.
- C. Notwithstanding any other provision of this Contract, if the Authority determines Contractor to be non-responsible, the Authority shall have the right to terminate the Contract for cause pursuant to the terms of Article 11.2 - Termination for Cause herein.

In such event, the Authority shall have all rights and remedies set forth in Article 11.2, including, without limitation, the right to complete Contractor's contractual requirements in any manner the Authority may deem advisable and to pursue available legal or equitable remedies for the breach.

- D. In no event shall termination of the Contract by the Authority for reasons of Contractor's non-responsibility be deemed a breach by the Authority, nor shall the Authority be liable for any damages or lost profits or otherwise that Contractor may incur as a result of such termination.
- E. The Authority may require at any time the removal of a subcontractor to the Contractor that the Authority determines is not responsible.

ARTICLE 12. DETERMINATION AS TO VARIANCES.

In any case of any ambiguity in the plans, specifications or maps, or between any of them, the matter must be immediately submitted to the Chief Engineer, Department of Engineering, who shall adjust the same, and his/her decision in relation thereto shall be final and conclusive upon the parties.

ARTICLE 13. SUCCESSORS AND ASSIGNS.

This Agreement shall bind the successors, assigns and representatives of the parties hereto.

ARTICLE 14. INTERNATIONAL BOYCOTT PROHIBITION.

In accordance with Chapter 406 of the Laws of 1981, the Contractor hereby promises, asserts and represents that neither the Contractor nor any substantially owned or affiliated person, firm, partnership or corporation has participated, is participating or shall participate in an international boycott in violation of the provisions of the United States Export Administration Act of 1969, as amended, or the United States Export Administration Act of 1979, or the effective Regulations of the United States Department of Commerce promulgated under either act.

It is understood further that the Authority in awarding a contract does so in material reliance upon the promise and representation made by the Contractor in the foregoing paragraph and that such contract shall be rendered forfeit and void by the State Comptroller if subsequent to the bid execution date, the Contractor or such owned or affiliated person, firm, partnership or corporation has been convicted of a violation of the aforesaid Acts or Regulations or has been found upon final determination of the United States Commerce Department or any other appropriate agency of the United States to have violated such Acts or Regulations.

The Contractor agrees to and shall notify the Chief Engineer, Department of Engineering and the Director of the Office of Construction Management and the Director of State Expenditures in the Office of the State Comptroller of any such conviction or final determination of violation within five (5) days thereof.

ARTICLE 15. CERTIFICATION OF STATE FINANCE LAW SECTIONS 139-J AND 139-K.

By execution of this Agreement the Contractor certifies that all information provided with respect to New York State Finance Law Section 139-j and Section 139-k is complete, true and accurate. The Authority shall have a right to terminate this Agreement in the event the Authority finds that the certification made by the Contractor in accordance with New York State Finance Law Sections 139-j and 139-k was intentionally false or intentionally incomplete. This

includes the Authority's right to terminate this Agreement at any time in the event the Authority finds that Contractor is non-responsible or has failed to accurately disclose vendor responsibility information.

ARTICLE 16. WRITTEN NOTICES.

All notices permitted or required hereunder shall be in writing and transmitted by either:

- a. certified or registered United States mail, return receipt requested;
- b. facsimile transmission;
- c. personal delivery;
- d. expedited delivery service; or
- e. e-mail.

Such notices shall be addressed to the individuals or titles named in the contract documents, or which are designated by the Contractor or the Authority at the pre-construction meeting, or which are designated by the Authority or the Contractor from time to time during the course of the Contract pursuant to the requirements herein.

Any such notice shall be deemed to have been given either at the time of personal delivery or, in the case of expedited delivery service or certified or registered United States mail, as of the date of first attempted delivery at the address and in the manner provided herein, or in the case of facsimile transmission or email, upon receipt.

The parties may, from time to time, specify a new or different address in the United States as their address for the purpose of receiving notice under this Agreement by giving fifteen (15) days written notice to the other party sent in accordance herewith. The parties agree to mutually designate individuals as their respective representatives for the purposes of receiving notices under this Agreement. Additional individuals may be designated in writing by the parties for purposes of implementation and administration/billing, resolving issues and problems and/or for dispute resolution.

ARTICLE 17. SUBCONTRACTING.

Contractor agrees not to subcontract any of its services without the prior written approval of the Authority.

Contractor retains ultimate responsibility for all services performed under the Agreement and shall pay any subcontractors promptly for work performed under this Agreement. Contractor shall be fully responsible to the Authority for the acts and omissions of its subcontractors, and of persons either directly or indirectly employed by them, just as Contractor is fully responsible to the Authority for the acts and omissions of persons directly employed by Contractor.

All subcontracts shall be in writing and shall contain provisions, which are functionally identical to, and consistent with, the provisions of this Agreement including, but not limited to, the body of this Agreement, Appendix A – Standard Clauses for New York State Thruway Authority Contracts, and the Contract Documents. Unless expressly waived in writing by the Authority, all subcontracts between the Contractor and its subcontractors shall expressly name the Authority, as the sole intended third party beneficiary of such subcontract. The Authority reserves the right to review and approve or reject any subcontract, as well as any amendment to said subcontract(s), and this right shall not make the Authority a party to any subcontract or create any right, claim, or interest in the subcontractor or proposed

subcontractor against the Authority. The Authority shall have the right to withdraw its consent to a subcontractor if, at the sole discretion of the Authority, it appears that the subcontract will delay, prevent, or otherwise impair Contractor's performance of services under this Agreement. Upon request, Contractor shall furnish to the Authority copies of all Contracts between Contractor and its subcontractors used to perform services for this Agreement.

The Authority reserves the right, at any time during the term of the Agreement, to verify that the written subcontract between Contractor and its subcontractors is in compliance with all of the provisions of this Article 17 and any subcontract provisions contained in this Agreement.

Contractor shall give the Authority immediate notice in writing of the initiation of any legal action or suit which relates in any way to a subcontract with a subcontractor or which may affect the performance of the Contractor's duties under the Agreement. Any subcontract shall not relieve the Contractor in any way of any responsibility, duty and/or obligation of the Agreement.

If at any time during performance under this Agreement total compensation to a subcontractor exceeds or is expected to exceed \$100,000, said subcontractor shall be required to electronically submit and certify a new Vendor Responsibility Questionnaire directly to the Office of the New York State Comptroller, or submit and certify all necessary updated information thereof.

Nothing contained in this Agreement shall create any contractual relationship between a subcontractor and the Authority.

ARTICLE 18. CONFIDENTIALITY AND NON-DISCLOSURE.

- A. "Confidential Information" means any information not generally known to the public, or that the Authority claims is confidential, whether oral, written, or electronic, that the Authority discloses, directly or indirectly, through any means of communication, to Contractor. Confidential Information includes, but is not limited to, operational and infrastructure information relating to: bid documents, plans, drawings, specifications, reports, product information and data; business and security processes and procedures; personnel and organizational data; financial statements; information system IP addresses, passwords, security controls, architectures and designs; and such other data, information and images that the Authority deems confidential.
- B. Confidential Information does not include information which, at the time of the Authority's disclosure to Contractor: (1) is already in the public domain or becomes publicly known through no act of Contractor; or (2) is already known by Contractor free of any confidentiality obligations.

If Contractor wants to disclose Confidential Information, it shall notify the Authority and specify the Confidential Information it wants to disclose. Contractor may only disclose such Confidential Information if the Authority approves such disclosure in writing, subject to such other terms and conditions as the Authority may require. Such approval, if given, shall only apply to the particular request and the specific Confidential Information for

which it is given.

If Contractor is required to disclose or make available, directly or indirectly, Confidential Information pursuant to statute, court or administrative order, subpoena, contractual obligation, or otherwise by law, Contractor shall: (1) notify the Authority that it has received such legal demand as soon as practicable, but in all events prior to any disclosure; (2) permit the Authority to take the steps it deems necessary and appropriate to protect the Confidential Information from disclosure; (3) cooperate to the fullest extent possible under the law with the Authority's efforts to protect the Confidential Information from disclosure; and (4) disclose only such Confidential Information, and only such portions thereof, as is required to satisfy the legal demand, and limit any such disclosure of Confidential Information to the fullest extent permissible under the law.

- C. Contractor may use Confidential Information solely for the purposes of providing services to the Authority pursuant to this Agreement. Contractor may make copies of Confidential Information but only to the extent necessary for the disclosures and uses permitted by this Agreement. Contractor will make commercially reasonable efforts to ensure that any copy of Confidential Information that is made is marked to show that it is or contains Confidential Information. Contractor may share Confidential Information with third parties: (i) that are required for Contractor's provision of services to the Authority pursuant to this Agreement (e.g., Contractors and subcontractors); and (ii) that agree in writing to be bound by the confidentiality provisions of this Agreement; however, Contractor may share only that Confidential Information that is necessary to the third party's contribution to Contractor's provision of services to the Authority pursuant to this Agreement and Contractor must first obtain the Authority's prior written consent.

The Authority's disclosure of Confidential Information to Contractor shall not convey to Contractor any right, title, or interest in or to such Confidential Information, and this Agreement does not transfer ownership of Confidential Information or grant a license thereto. The Authority shall retain all right, title, and interest in and to all such Confidential Information at all times.

- D. Contractor shall hold Confidential Information confidential to the maximum extent permitted by law. Contractor shall safeguard Confidential Information with at least the same level of care and security that Contractor uses to maintain and protect from disclosure its own confidential information, using all reasonable and necessary security measures, devices, and procedures that Contractor uses to maintain its own confidential information, but in all events with not less than reasonable care.

Contractor shall take reasonable steps to prevent unauthorized access to, use of, or disclosure of Confidential Information, including without limitation, by protecting its passwords and other log-in information. Contractor shall notify the Authority immediately of any known or suspected misuse or misappropriation of Confidential Information and shall use its best efforts to stop said misuse or misappropriation.

- E. Upon written request of the Authority, or upon expiration or termination of this Agreement, Contractor shall return all Confidential Information to the Authority, or certify in writing that it has been destroyed and no copies exist.

- F. Contractor agrees that breach of this Article 18 would cause the Authority irreparable

injury, for which monetary damages would not provide adequate compensation, and that in addition to any other remedy, the Authority will be entitled to injunctive relief against such breach or threatened breach, without proving actual damages or posting a bond or other security.

- G. Without limiting the foregoing, the obligations and assurances involving Confidential Information pursuant to this Agreement shall survive termination or expiration of this Agreement.

ARTICLE 19. NEW YORK STATE HUMAN RIGHTS LAW, ARTICLE 15 OF THE EXECUTIVE LAW.

The New York State Human Rights Law, Article 15 of the Executive Law, prohibits discrimination (including to refuse to hire or employ or to bar or to discharge from employment an individual or to discriminate against such individual in compensation or in terms, conditions or privileges of employment) and harassment based on age, race, creed, color, national origin, sex, , sexual orientation, gender identity or expression, disability, marital status, familial status, domestic violence victim status, prior arrest or conviction record, military status or predisposing genetic characteristics, or because the individual has opposed any practices forbidden under the Human Rights Law or because the individual has filed a complaint, testified or assisted in any proceeding under the Human Rights Law, regardless of whether such harassment would be considered severe or pervasive under precedent applied to harassment claims. Harassment is an unlawful discriminatory practice when it subjects an individual to inferior terms, conditions or privileges of employment because of the individual's membership in one or more of these protected categories.

The Human Rights Law may also require reasonable accommodation for persons with disabilities and pregnancy-related conditions. A reasonable accommodation is an adjustment to a job or work environment that enables a person with a disability to perform the essential functions of a job in a reasonable manner. The Human Rights Law may also require reasonable accommodation in employment on the basis of Sabbath observance or religious practices.

Generally, the Human Rights Law applies to:

- all employers of four or more people, employment agencies, labor organizations and apprenticeship training programs in all instances of discrimination or harassment;
- employers with fewer than four employees in all cases involving sexual harassment; and,
- any employer of domestic workers in cases involving sexual harassment or harassment based on gender, race, religion or national origin.

In accordance with New York State Executive Order No. 177, by execution of this Agreement, Contractor hereby certifies, that it does not have institutional policies or practices that fail to address the harassment and discrimination of individuals on the basis of their age, race, creed, color, national origin, sex, sexual orientation, gender identity, disability, marital status, military status, or other protected status under the Human Rights Law.

Executive Order No. 177 and the aforementioned certification do not affect institutional policies or practices that are protected by existing law, including but not limited to the First Amendment of the United States Constitution, Article 1, Section 3 of the New York State Constitution, and Section 296(11) of the New York State Human Rights Law.

ARTICLE 20. DEBARMENT CERTIFICATION.

A. The Contractor certifies to the best of its knowledge and belief, that it and its principals:

1. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency;
2. Have not within a three-year period preceding this contract been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
3. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (A)(2) of this certification; and
4. Have not within a three-year period preceding this application/proposal/contract had one or more public transactions (Federal, State or local) terminated for cause or default.

ARTICLE 21. CONFLICTS OF INTEREST.

- A. Contractor has provided as Exhibit V (attached hereto and made a part of this Agreement), the Vendor Assurance of No Conflict of Interest or Detrimental Effect form, signed by an authorized executive or legal representative attesting that Contractor's performance of the services does not and will not create a conflict of interest with, nor position Contractor to breach any other contract currently in force with the Authority or the State of New York, that Contractor will not act in any manner that is detrimental to any Authority or State of New York project for which Contractor is rendering services.
- B. Contractor hereby reaffirms the attestations made in its proposal and covenants and represents that there is and shall be no actual or potential conflict of interest that could prevent Contractor's satisfactory or ethical performance of duties required to be performed pursuant to the terms of this Agreement. Contractor hereby agrees it shall have a continuing affirmative duty and obligation to notify the Authority immediately of any actual or potential conflicts of interest.
- C. In conjunction with any subcontract under this Agreement, Contractor shall obtain and deliver to the Authority, prior to entering into a subcontract, a Vendor Assurance of No Conflict of Interest or Detrimental Effect form, signed by an authorized executive or legal representative of the subcontractor. Contractor shall also require in any subcontracting agreement that the subcontractor, in conjunction with any further subcontracting agreement, obtain and deliver to the Authority a signed and completed Vendor Assurance of No Conflict of Interest or Detrimental Effect form for each of its subcontractors prior to entering into a subcontract.
- D. The Authority and Contractor recognize that conflicts may occur in the future because

Contractor may have existing, or establish new, relationships. The Authority will review the nature of any relationships and reserves the right to terminate this Agreement for any reason, or for cause, if, in the judgment of the Authority, a real or potential conflict of interest cannot be cured.

ARTICLE 22. ETHICS.

Contractor and subcontractors may hire former State agency or Authority employees. However, as a general rule and in accordance with New York Public Officers Law, former employees of the Authority may neither appear nor practice before the Authority, nor receive compensation for services rendered on a matter before the Authority, for a period of two years following their separation from Authority service. In addition, former Authority employees are subject to a "lifetime bar" from appearing before the Authority or receiving compensation for services regarding any transaction in which they personally participated or which was under their active consideration during their tenure with the Authority.

During the term of the Agreement, Contractor and its subcontractors shall not engage any person who is, or has been at any time, in the employ of the Authority or New York State to perform services under the Agreement in violation of: the provisions of the Public Officers Law ("POL"); the rules, regulations, opinions, guidelines, or policies promulgated or issued by the New York State Joint Commission on Public Ethics ("JCOPE Regulations"); and any other laws applicable to the service of current or former Authority or New York State employees ("Other Laws," and, together with POL and JCOPE Regulations, collectively, the "Ethics Provisions"). Contractor certifies that all of its employees and employees of any subcontractor who are former employees of the Authority or New York State and who are assigned to perform services under the Agreement shall be assigned in accordance with all Ethics Provisions. Further, during the term of the Agreement, no person who is employed by Contractor or its subcontractors and who is disqualified from providing services under the Agreement pursuant to any Ethics Provisions may share in any net revenues Contractor or its subcontractors derives from the Agreement.

Contractor shall identify and provide the Authority with notice of those employees of Contractor or its subcontractors who are former employees of the Authority or New York State and who will be assigned to perform services under the Agreement, and shall ensure that such employees comply with all applicable laws and prohibitions. The Authority may, request that Contractor provide it with whatever information the Authority deems appropriate about each such person's engagement, work cooperatively with the Authority to solicit advice from the New York State Joint Commission on Public Ethics, and, if deemed appropriate by the Authority, instruct any such person to seek the opinion of the Joint Commission on Public Ethics. The Authority shall have the right to withdraw or withhold approval of any subcontractor if utilizing such subcontractor for any work performed hereunder would be in conflict with any of the Ethics Requirements. The Authority shall have the right to cancel or terminate the Agreement at any time if any work performed under the Agreement is in conflict with any Ethics Provisions.

ARTICLE 23. MINORITY AND WOMEN BUSINESS ENTERPRISE GOALS AND SERVICE DISABLED VETERANS OWNED BUSINESS GOALS.

This Contract is subject to State provisions (including State Executive Law 15-A and 5 NYCRR Parts 140-145) concerning the utilization of Minority-Owned Business Enterprises (MBE) and Women-Owned Business Enterprises (WBE) (collectively M/WBE). All State M/WBE requirements are applicable to this Contract. The approved overall combined MBE and WBE participation goal for the project is established in the Contract Documents.

This Contract is subject to State provisions (including State Executive Law 15-A and 5 NYCRR Parts 140-145) concerning the utilization of Service Disabled Veterans Owned Business (SDVOB). All State SDVOB requirements are applicable to this Contract. The approved overall SDVOB participation goal for the project is established in the Contract Documents.

ARTICLE 24. IRAN DIVESTMENT ACT- SECTION 2879-C OF THE PUBLIC AUTHORITIES LAW.

- A. As used in this Article 24, "person" has the meaning set forth in paragraph (e) of subdivision 1 of Section 165-a of the State Finance Law.
- B. As used in this Article 24 "Contract" means this Agreement.
- C. Contractor hereby provides the following certification: By signing this Contract, each person and each person signing on behalf of any other party certifies, and in the case of a joint bid or partnership each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief, that each person is not on the list created pursuant to paragraph (b) of subdivision 3 of Section 165-a of the State Finance Law.

ARTICLE 25. COVENANT AGAINST CONTINGENT FEES.

Contractor warrants that it has not employed or retained any company or person, other than a bona fide employee working for Contractor, to solicit or secure this Agreement, and has not paid or agreed to pay any company or person, other than a bona fide employee, any fee, commission, percentage, brokerage fee, gift, or any other consideration, contingent upon or resulting from the award or making of this Agreement. In the event Contractor violates this warranty, Authority shall have the right to terminate this Agreement without liability, or, in its discretion, to deduct from payments otherwise owed to the Contractor for services provided pursuant to this Agreement the full amount of such fee, commission, percentage, brokerage fee, gift or other consideration.

ARTICLE 26. COMPLIANCE MONITORING.

In the event that the Contractor, its affiliates or any subcontractor is or becomes subject to a compliance monitoring requirement consequent to an agreement with a governmental entity at any time prior to completion of the contract, the Contractor shall promptly notify the Authority of the same. Compliance monitoring means any requirement imposed by a governmental entity arising from an investigation of activities of the Contractor, its affiliates, or any subcontractor concerning alleged compliance violations, pursuant to which the subject entity is obligated to allow an independent third party to review, analyze, investigate or report on that entity's future compliance with governmental rules and/or contractual requirements arising from governmental rules. Said notice shall be in writing and shall include (i) a copy of the order, settlement or other document setting forth the requirement to implement a monitoring program and (ii) the specific requirements and conditions of the required program. If the order, settlement or other document is subject to confidentiality protection that cannot be unilaterally waived by the Contractor or the entity that is subject to the requirement, the Contractor shall cause the subject entity to confirm that it is subject to a compliance monitoring requirement

and to provide a confidential summary of the terms and conditions of the monitoring requirement to the Contractor, with a copy to the Authority.

The Contractor shall further cause the subject entity to promptly notify the Contractor, with a copy to the Authority, of any violations of the monitoring program by the subject entity and of any other concerns expressed by the monitor regarding compliance with the monitoring program requirements. In such event, the Contractor shall provide to the Authority a detailed written report as to whether and to what extent, if any, the violation or concerns expressed by the monitor are relevant to the Contractor's compliance with its Contract obligations, or to the performance of work by the Contractor. The Authority shall at all times have the right to independently investigate whether any matter raised by the monitor will have any effect upon the Contractor's compliance with its Contract obligations or performance of work by the Contractor and/or subject entity. If any such violation occurs or concerns expressed by the monitor involve compliance requirements that are deemed by the Authority to be relevant to the Contract, the Authority shall have the right to require the Contractor to institute, at Contractor expense, additional data keeping, reporting, and/or other safeguard measures, including permitting independent auditing and access to pertinent records of the Contractor or the subject entity to mitigate risk that a similar violation will occur on the project or be a cause for concern with respect to the Contractor's performance of its obligations under the Contract. The Authority's audit rights under the Contract shall include the right to audit and access pertinent records of the Contractor or the subject entity relating to compliance issues described herein.

The Authority agrees to take all reasonable measures to maintain the confidentiality (to the extent permitted by law) of any information provided by Contractor and/or the subject entity pursuant to this Article 26 which the Contractor has reasonably designated as confidential, and the provisions of Appendix A, Section 9 of the New York State Thruway Authority Addendum to the Standard Specifications, of the Agreement shall apply with respect to disclosure of any such Records under the Statute (as defined in such section). Any intra-agency written materials prepared by the Authority, or any written inter-agency materials that are in the possession or control of the Authority, to the extent based on information or records designated as confidential or exempt from disclosure under the Statute as provided in the preceding sentence, shall also be designated and treated as such by the Authority to the fullest extent permitted by law. The Authority may disclose any of the aforementioned information, records and materials to the New York State Department of Transportation, provided that the Department agrees to treat such information, records and material in the same manner as required of the Authority under this paragraph.

The rights and remedies granted to the Authority under this Article 26 are in addition to, and not to the exclusion of, any and all of its rights and remedies under the Contract or at law or in equity.

ARTICLE 27. INDEMNIFICATION.

The Contractor shall be responsible for all damage to life and property due to negligent or otherwise tortious acts, errors or omissions of the Contractor in connection with its services under the Contract Documents. To the fullest extent permitted by law: (a) the Contractor shall indemnify, hold harmless, and release the Authority, the State of New York, any municipality in which the Work is being performed; and/or any public benefit corporation, railroad or public utility whose property or facilities are affected by the Work from suits, claims, actions, damages, and costs of every name and description resulting from the Work under this Contract and until the Final Acceptance thereof; (b) with respect to personal injury or property damage occurring after Final Acceptance and not covered by the indemnity in clause Article 27 (a), the Contractor shall indemnify, hold harmless, and release the Authority, the State of New York, any municipality in which the Work is being performed;

and/or any public benefit corporation, railroad or public utility from suits, claims, actions, damages, and costs of every name and description resulting from negligent or otherwise tortious acts, errors or omissions of the Contractor in connection with its services under the Contract Documents; and (c) the Contractor shall indemnify, hold harmless, and release the Authority's Inspector from suits, claims, actions, damages, and costs involving personal injury and property damage resulting from the Contractor's Work under the Contract during its prosecution and until the Final Acceptance thereof. The Authority may retain such monies from the amount due the Contractor as may be necessary to satisfy any claim for damages recovered against the Authority, the State of New York, any municipality in which the Work is being performed, any public benefit corporation, railroad, or public utility whose property or facilities are affected by the Work, or the Authority's Inspectors. The Contractor's obligation under this paragraph shall not be deemed waived by the failure of the Authority to retain the whole or any part of such monies due the Contractor, or where such suit, action, damages, and/or costs have not been resolved or determined prior to release of any monies to the Contractor under the Contract. Such obligation shall not be deemed limited or discharged by the enumeration or procurement of any insurance for liability for damages imposed by law upon the Contractor, Subcontractors, the Authority, the State, any municipality in which the Work is being performed, any public benefit corporation, railroad, or public utility whose property or facilities are affected by the Work, or any Department consultants or contractors working relative to the Project.

The Contractor has the obligation, at its own expense, for the defense of any action or proceeding which may be brought against the parties specified in this Article. This obligation shall include the cost of attorney fees, disbursements, costs, and other expenses incurred in connection with such action or proceeding. The provisions of this Article shall survive the expiration or termination of the Contract.

Without limiting the generality of the foregoing, Contractor's obligation to indemnify, save harmless and release the Persons identified in this article specifically includes any suits, claims, actions, damages, and costs of every name and description resulting from any spill or release or threatened spill or release of a Hazardous Material (i) attributable to the negligence, willful misconduct or breach of contract by Contractor, its Subcontractors or agents, or (ii) which was brought onto the Site by Contractor or any of its Subcontractors or agents.

Notwithstanding the foregoing, the Authority reserves the right to join such action, at its sole expense, when it determines there is an issue involving a significant public interest. Such obligation does not extend to those suits, actions, damages, and costs of every name which arise out of the sole negligence of the Authority, the State of New York, any municipality in which the Work is being performed, any public benefit corporation, railroad, or public utility whose property or facilities are affected by the Work of the Project, or any Authority consultants or Contractors working relative to the Project, their agents, or their employees.

ARTICLE 28. NOTICES REGARDING CLAIMS, LITIGATION AND RULINGS.

The Contractor shall promptly provide written notice to the Authority of all claims, litigation and governmental rulings pertaining to the work where such claims, litigation or rulings could subject the Authority to liability or substantially impair the completion of the Contract work. With such notice, the Contractor shall include a brief summary of the issue involved and the Contractor's position on such issue. Such written notice is additional to and not in place of any other notices required by the Contract Documents. The Contractor shall cooperate and provide, and shall require all subcontractors to cooperate and provide, such information or

records as may be reasonably requested by the Authority concerning such claims, litigation or rulings.

ARTICLE 29. COOPERATION AND FURTHER ASSURANCES.

Contractor shall cooperate and provide, and shall cause all subcontractors to cooperate and provide, such information as is necessary or requested by the Authority to assist or facilitate the submission by the Authority of any documentation, reports or analysis required by the State, and/or any other governmental entity with jurisdiction over the work. The Contractor shall promptly execute and deliver to the Authority all such instruments and other documents and assurances as are reasonably requested by the Authority to further evidence the obligations of the Contractor under the Contract.

ARTICLE 30. SEVERABILITY.

If any clause, provision, section, article or part of any of the Contract Documents is ruled invalid by a court having proper jurisdiction, the invalidity or unenforceability of any such clause, provision, section, article or part shall not affect the validity or enforceability of the balance of the Contract Documents, which shall be construed and enforced as if the Contract Documents did not contain such invalid or unenforceable clause, provision, section, article or part.

ARTICLE 31. ENVIRONMENTAL REVIEW

Article 31.1 Lead Agency

The Authority reserves the right to be “lead agency” for any compliance with the New York State Environmental Quality Review Act (SEQRA), and the appropriate federal agency shall serve as “lead agency” for the National Environmental Policy Act (NEPA), as may be required for this Agreement or any activity undertaken by Contractor pursuant to this Agreement.

Article 31.2 Executive Order 22

Embodied Carbon Disclosure: For building materials covered by the GreenNY Council Embodied Carbon Guidance, Contractors and designers shall disclose, at regular intervals during the course of the contract period (and no less than once a year), the exact materials/product type and estimated quantities used. For materials for which Environmental Product Declarations (EPDs) exist that comply with the GreenNY Council requirements, Contractors are also required to submit kgCO₂ equivalent estimates by material/product, and quantity used, on the project to date, with a .pdf copy of the EPD or a link to the digital EPD. (Please see the EO22 Special Note contained in the Special Notes section of this proposal).

Contract Number:

In addition to the acceptance of this contract, I also certify that original copies of this signature page will be attached to all other exact copies of this contract.

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

NEW YORK STATE
THRUWAY AUTHORITY

By _____
Chief Engineer

Date _____

Contractor

NEW YORK STATE
THRUWAY AUTHORITY

Recommended as to Availability of Funds:

By _____
Chief Financial Officer

Date _____

(ACKNOWLEDGMENT BY INDIVIDUAL CONTRACTOR)

STATE OF NEW YORK

COUNTY OF _____ ss.:

On this _____ day of _____, 202_,
 before me personally came _____ to me
 known and known to me to be the person described in and who executed the foregoing instrument,
 and acknowledged that he executed the same.

Notary Public

(ACKNOWLEDGMENT BY CO-PARTNERSHIP CONTRACTOR)

STATE OF NEW YORK

COUNTY OF _____ ss.:

On this _____ day of _____, 202_
 before me personally came and appeared _____ to me known and known
 to me to be the person who executed the above instrument, who, being sworn by me, did for himself
 depose and say that he is a member of the firm of _____ consisting of
 himself and _____ and that he executed the foregoing instrument in the
 firm name of _____ and that he had authority to sign same, and he did duly
 acknowledge to me that he executed the same as the act and deed of said firm of
 _____, for the uses and purposes mentioned therein.

Notary Public

(ACKNOWLEDGEMENT OF A CORPORATION)

STATE OF NEW YORK }
 }
 COUNTY OF }

On this _____ day of _____, 202_,
 before me personally came _____, to me known and known to me to
 be the person who executed the above instrument, who being duly sworn by me, did depose and
 say that he/she resides in _____, that he/she is the
 _____ of _____, the corporation
 described in and which executed the above instrument, and that he/she signed his/her name thereto
 on behalf of said Corporation by order of the Board of Directors of said Corporation.

Notary Public

Exhibit V**Vendor Assurance of No Conflict of Interest or Detrimental Effect**

The undersigned entity ("Contractor"), offering to provide services pursuant to this Agreement, as a contractor, joint venture contractor, subcontractor, or consultant, attests that its performance of the services outlined in this Agreement does not and will not create a conflict of interest with nor position the Contractor to breach any other contract currently in force with the New York State Thruway Authority ("Authority").

Furthermore, the Contractor attests that it will not act in any manner that is detrimental to any Authority project on which the Contractor is rendering services. Specifically, the Contractor attests and certifies that:

1. The fulfillment of obligations by the Contractor does not violate any existing contracts or agreements between the Contractor and the Authority;
2. The fulfillment of obligations by the Contractor does not and will not create any conflict of interest, or perception thereof, with any current role or responsibility that the Contractor has with regard to any existing contracts or agreements between the Contractor and the Authority;
3. The fulfillment of obligations by the Contractor does not and will not compromise the Contractor's ability to carry out its obligations under any existing contracts between the Contractor and the Authority;
4. The fulfillment of any other contractual obligations that the Contractor has with the Authority will not affect or influence its ability to perform under the Agreement;
5. During the negotiation and execution of any contract, the Contractor will not knowingly take any action or make any decision which creates a potential for conflict of interest or might cause a detrimental impact to the Authority as a whole including, but not limited to, any action or decision to divert resources from one Authority project to another;
6. In fulfilling obligations under each of its Authority contracts, including this Agreement, the Contractor will act in accordance with the terms of each of its Authority contracts and will not knowingly take any action or make any decision which might cause a detrimental impact to the Authority as a whole including, but not limited to, any action or decision to divert resources from one Authority project to another;
7. No former officer or employee of the Authority or State of New York ("State") who is now employed by the Contractor, nor any former officer or employee of the Contractor who is now employed by the Authority or State, has played a role with regard to the administration of this contract procurement in a manner that may violate section 73(8)(a) of the New York State Public Officers Law; and
8. The Contractor has not and shall not offer to any employee, member or director of the Authority any gift, whether in the form of money, service, loan, travel, entertainment, hospitality, thing or promise, or in any other form, under circumstances in which it could reasonably be inferred that the gift was intended to influence said employee, member or director, or could reasonably be expected to influence said employee, member or director, in the performance of the official duty of said

employee, member or director or was intended as a reward for any official action on the part of said employee, member or director.

Contractor agrees that the Authority recognizes that conflicts may occur in the future because a Contractor may have existing or new relationships. The Authority will review the nature of any such new relationship and reserves the right to terminate the contract for cause if, in its judgment, a real or potential conflict of interest cannot be cured.

This form must be signed by an authorized executive or legal representative.

Contractor Name

Name of Signatory

Title of Signatory

Signature:

Date:

CONTRACT:

COUNTY:

FAITHFUL PERFORMANCE BOND

BOND

Know all men by these presents, that we (hereinafter called the "Principal")

and _____

of _____ (hereinafter called the "Surety") are held and firmly bound unto the New York State Thruway Authority, (hereinafter called the "Authority"), in the full and just sum of _____ good and lawful money of the United States of America for the payment of which said sum of money, well and truly to be made and done, the said Principal binds himself, his heirs, executors, administrators or assignees and the said SURETY binds itself, its successors or assigns, jointly and severally, firmly by these presents.

Signed, sealed and dated this _____ of _____, 202 _____,

Whereas, said Principal has entered into a certain written contract bearing date of the _____ day of _____, 202 with the Authority for:

Now, therefore, THE CONDITION OF THIS OBLIGATION IS SUCH that if the said Principal shall well, truly and faithfully perform the work in accordance with the terms of the contract, and with the plans and specifications, and will commence and complete the work within the time prescribed in the contract, on his part to be kept and performed according to the terms and tenor of said contract, and shall protect the said N.Y.S. Thruway Authority against, and pay any excess of cost as provided in said contract, and all amounts, damages, costs and judgments which may be recovered against said N.Y.S. Thruway Authority, N.Y.S. Dept. of Transportation the Commissioner of Transportation and the State of N.Y. or its or any of their officers or agents or which the said aforementioned may be called upon to pay to any person or corporation by reason of any damages, direct or indirect, arising or growing out of the doing of said work, or from the negligence, non-feasance, misfeasance, or malfeasance of any officer, agent or employee of the aforementioned, or suffered or claimed on account of aforesaid work during the time thereof and until the final completion and acceptance of the work, or the manner of doing the same, or the neglect of the said Principal, or his agents, or servants, or the improper performance of the said work by the said Principal, or his agents, or servants, or from any other cause, then this obligation shall be null and void, otherwise to remain in full force and virtue.

In the event of a failure of performance of the contract by the Principal, which shall include, but not be limited to, any breach or default of the contract by the Principal, or in case said contract is forfeited by the Principal in the manner provided for in the contract and the said Surety, for value received, hereby stipulates and agrees, if requested to do so by the Authority, has the option to either remedy the default, or breach or forfeiture of the Principal or take charge and fully perform and complete the work, mentioned and described in said contract and specifications, pursuant to the terms, conditions and covenants thereof and as may be amended, at its own expense. The procedure by which the surety undertakes to discharge its obligations under the bond shall be subject to the advance written approval of the Authority. If the Surety completes the contract, it shall be paid for the actual items of work performed in accordance with the Principal's contract terms and prices. In the event the Surety assumes the rights and obligations of the Principal.

It shall be the duty of the Surety to give unequivocal notice in writing to the Authority, within forty-five (45) days after receipt of written notice from the Authority to the Surety, of the Surety's election to remedy default(s) or breach(es) or forfeiture(s) promptly or to perform and fully complete the contract promptly as provided herein, time being of the essence of this bond. In said notice of election, the Surety shall state the date on which the remedy or performance shall commence. During the period between the Authority's notice and Surety's performance of the contract or remedy of the default, breach or forfeiture, the Surety shall be liable for and agrees to pay any and all reasonable and necessary costs as determined by the Authority to maintain the project site safe and convenient to the public.

It shall also be the duty of the Surety to give prompt notice in writing to the Authority upon completion of the remedy and/or correction of each breach or default or completion of the contract. The surety shall not assert solvency of its Principal or its Principal's denial of default as justification for its failure to give notice of election or for its failure to promptly remedy the breach or default or to complete the contract.

In the event the Surety shall fail to exercise either option or to act promptly then the Authority shall give ten (10) days notice of such failure, both to the Principal and the Surety, and after the expiration of the 10 days the Authority may cause the work to be completed in accordance with the contract, and the Surety and the Principal shall be jointly and severally liable for the amount of the excess cost of completing the contract work beyond the amounts remaining for this contract adjusted for the work actually performed. When the cost of completion of performance by the Obligee is estimated, the Principal and Surety shall pay, free from all liens and encumbrances, the Authority determined estimated completion costs above funds remaining for this contract, to the Authority within 30 days of receipt of the estimate. Adjustment to the Authority's estimated completion cost will be made upon the Authority's final acceptance of the work and appropriate refunds, if any, will be promptly made to the Surety. Any actual costs in excess of the estimated price shall be paid to the Authority promptly on demand. Additionally, Principal and Surety shall be liable for any applicable liquidated and/or engineering costs or damages.

In addition, the said Principal and Surety further agree, as part of this obligation, to pay all damages of any kind to person or property that may result from a failure in any respect to perform and complete said contract including, but not limited to costs necessary to protect the traveling public or to avoid inconvenience to the traveling public, (liquidated damages as provided above) all repair and replacement costs necessary to rectify construction errors, architectural and engineering costs and fees, all Contractor fees, all testing and laboratory fees, and all interest, legal fees and litigation costs incurred by the Authority.

And the said Surety hereby stipulates and agrees that no change, extension, alteration, deduction of addition in or to the terms of the said contract or the plans or specification accompanying the same shall in any wise affect the obligation of said Surety on its bond.

Contractor Name _____ L.S.

(Corporate seal of _____ L.S. Principal

principal if a corporation.) _____ L.S.

(Corporate seal of _____ L.S.
surety.)

_____ L.S. Surety

STATE OF NEW YORK
OFFICE OF THE ATTORNEY GENERAL

I hereby approve the foregoing contract and bond as to form and manner of execution.

Dated _____

Attorney General

(ACKNOWLEDGMENT BY PRINCIPAL, UNLESS IT BE A CORPORATION)

STATE OF NEW YORK,

COUNTY OF _____ ss.:

On this _____ day of _____, 202__, before me personally came _____ to me known, to be the person described in and who executed the foregoing instrument and he acknowledged that he executed the same.

Notary Public

(Notary's seal to be attached.)

(ACKNOWLEDGMENT BY PRINCIPAL, IF A CORPORATION)

STATE OF NEW YORK,

COUNTY OF _____ ss.:

On this _____ day of _____, 202__, before me personally came _____ to me known, who being by me duly sworn, did depose and say that he resides in _____, that he is the _____ of _____, the corporation described in and which executed the foregoing instrument: that he knew the seal of the said corporation: that the seal affixed to said instrument was such corporate seal: that it was so affixed by order of the Board of Directors of said corporation, and that he signed his name thereto by like order.

Notary Public

(ACKNOWLEDGED BY SURETY COMPANY)

STATE OF NEW YORK,

COUNTY OF _____ ss.:

On this _____ day of _____, 202_, before me personally came _____ to me known, who being by me duly sworn, did depose and say that he resides in _____, that he is the _____ of _____, the corporation described in and which executed the foregoing instrument: that he knew the seal of the said corporation: that the seal affixed to said instrument was such corporate seal: that it was so affixed by order of the Board of Directors of said corporation, and that he signed his name thereto by like order.

Notary Public

(Notary's seal to be attached.)

(The Surety Company must append statement of its financial condition and a copy of the resolution authorizing the execution of Bonds by officers of the Company.)

NEW YORK STATE THRUWAY AUTHORITY

LABOR AND MATERIAL BOND

Know all men by these presents,

That, _____
(Name of Principal)

of _____

(hereinafter called the Principal, and _____
(Name of Surety Company)

a corporation of the State of _____, authorized to do business in the State of New York, as
Surety and whose principal office is located in the City of _____, State of _____
(hereinafter called the Surety), are held and firmly bound unto the NEW YORK STATE THRUWAY AUTHORITY,
(hereinafter called the Authority), in the full and just sum of

_____ good and lawful money of the United
States of America, for the payment of which said sum of money, well and truly to be made and done, the said
Principal and Surety bind themselves, their and each of their heirs, administrators, executors, successors and
assigns, jointly and severally, firmly by these presents.

Whereas, said Principal has entered into a certain written contract, with the Authority bearing date _____
_____ day of _____ 202_, with the New York State Thruway Authority for:

Which contract is hereby referred to and made a part here of as fully and to the same extent as if copied at length
herein.

Now therefore, the condition of this obligation is such that if the said Principal shall promptly pay all moneys due
to all persons furnishing labor and materials to him or his subcontractors in the prosecution of work provided for
in said 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 said 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 said contract
was to be performed, or if said contract was to be performed in more than one county, then in any such county,
and not elsewhere.

SIGNED, SEALED AND DELIVERED THIS _____ day of _____, 202_

(Principal(s) Sign Here)
(Affix Corporate Seal If a Corporation)

(Surety Signs Here)
(Affix Corporate Seal of Surety Co.)

FOR PRINCIPAL'S USE ONLY (Use Only One)

(INDIVIDUAL ACKNOWLEDGMENT)
UNLESS A CORPORATION

STATE OF _____

COUNTY OF _____ ss.:

On this _____ day of _____, 202_, before me personally came _____ to me known and known to me to be the person mentioned and described in and who executed in foregoing instrument and he duly acknowledged to me that he executed the same.

Notary Public

(ACKNOWLEDGEMENT OF A CORPORATION)

STATE OF NEW YORK }
 }
COUNTY OF }

On this _____ day of _____, 202_, before me personally came _____, to me known and known to me to be the person who executed the above instrument, who being duly sworn by me, did depose and say that he/she resides in _____, that he/she is the _____ of _____, the corporation described in and which executed the above instrument, and that he/she signed his/her name thereto on behalf of said Corporation by order of the Board of Directors of said Corporation.

Notary Public

FOR SURETY'S USE ONLY

(SURETY ACKNOWLEDGMENT)

STATE OF _____

COUNTY OF _____ ss.:

On this _____ day of _____, 202_, before me personally came _____ that he is the _____ of the _____ the corporation described in and which executed the above instruments; that he knows the seal of said corporation, that the seal affixed to said instrument is such corporate seal; that it was so affixed by order of the Board of Directors of Said corporation, and that he signed his name thereto by like order.

Notary Public

APPENDIX A**Standard Clauses For New York State Thruway Authority Contracts**

The parties to the attached contract, license, lease, amendment or other agreement of any kind (“the contract” or “this contract”) agree to be bound by the following clauses which are hereby made a part of the contract (the word “Contractor” herein refers to any party and its agents, successors and assigns, other than the Thruway Authority (“Authority”), whether a contractor, licensor, licensee, lessor, lessee or any other party):

1. **NON-ASSIGNMENT CLAUSE.** This contract may not be assigned by the Contractor nor may its right, title or interest therein be assigned, transferred, conveyed, subcontracted, sublet or otherwise disposed of without the previous consent, in writing, of the Authority and any attempts to assign the contract without the Authority’s written consent are null and void.

2. **COMPTROLLER APPROVAL.** Where required by law, this contract may require approval of the State Comptroller and shall not be valid until it has been approved by the State Comptroller and filed in its office.

3. **WORKERS’ COMPENSATION AND DISABILITY BENEFITS.** This contract shall be void and of no force and effect unless the Contractor shall provide and maintain coverage during the life of this contract for the benefit of such employees as are required to be covered by the provisions of the State Workers’ Compensation Law. If employees will be working on, near or over navigable waters, a U.S. Longshore and Harbor Workers’ Compensation Act endorsement must be included.

4. **NON-DISCRIMINATION REQUIREMENTS.** To the extent required by Article 15 of the State Executive Law (also known as the Human Rights Law) and all other State and Federal statutory and constitutional non-discrimination provisions, the Contractor will not discriminate against any employee or applicant for employment because of race, creed, color, sex (including gender identity or expression), national origin, sexual orientation, military status, age, disability, predisposing genetic characteristics, marital status or domestic violence victim status or because the individual has opposed any practices forbidden under the Human Rights Law or has filed a complaint, testified, or assisted in any proceeding under the Human Rights Law. Furthermore, in accordance with State Labor Law §220-e, if this is a contract for the construction, alteration or repair of any public building or public work or for the manufacture, sale or distribution of materials, equipment or supplies, and to the extent that this contract shall be performed within the State of New York, Contractor agrees that neither it nor its subcontractors shall by reason of race, creed, color, disability, sex or national origin: (a) discriminate in hiring against any New York State citizen who is qualified and

available to perform the work; or (b) discriminate against or intimidate any employee hired for the performance of work under this contract. If this is a building service contract as defined in State Labor Law §230, then, in accordance with §239 thereof, the Contractor agrees that neither it nor its subcontractors shall, by reason of race, creed, color, national origin, age, sex or disability: (a) discriminate in hiring against any New York State citizen who is qualified and available to perform the work; or (b) discriminate against or intimidate any employee hired for the performance of work under this contract. The Contractor is subject to fines of \$50 per person per day for any violation of State Labor Law §§220-e or 239 as well as possible termination of this contract and forfeiture of all moneys due hereunder for a second or subsequent violation.

5. **WAGE AND HOURS PROVISIONS.** If this is a public work contract covered by Article 8 of the State Labor Law or a building service contract covered by Article 9 thereof, neither the Contractor’s employees nor the employees of its subcontractors may be required or permitted to work more than the number of hours or days stated in said statutes, except as otherwise provided in the State Labor Law and as set forth in prevailing wage and supplement schedules issued by the State Labor Department. Furthermore, the Contractor and its subcontractors must pay at least the prevailing wage rate and pay or provide the prevailing supplements, including the premium rates for overtime pay, as determined by the State Labor Department in accordance with the State Labor Law. Additionally, effective April 28, 2008, if this is a public work contract covered by Article 8 of the New York State Labor Law, the Contractor understands and agrees that the filing of payrolls in a manner consistent with subdivision 3-a of §220 of the New York State Labor Law shall be a condition precedent to payment by the Authority of any Authority approved sums due and owing for work done on the project.

6. **NON-COLLUSIVE BIDDING CERTIFICATION.** In accordance with State Public Authorities Law §2878, if this contract was awarded based upon the submission of bids, the Contractor warrants, under penalty of perjury, that its bid was arrived at independently and without collusion aimed at restricting competition. The Contractor further warrants that, at the time the Contractor submitted its bid, an authorized and responsible person executed and delivered to the Authority a non-collusive bidding certification on the Contractor’s behalf.

7. **INTERNATIONAL BOYCOTT PROHIBITION.** In accordance with State Labor Law §220-f, if this contract exceeds \$5,000, the Contractor agrees, as a material condition of this contract, that neither the Contractor nor any substantially owned or affiliated person, firm, partnership, or corporation has participated, is participating, or shall

participate in an international boycott in violation of the Federal Export Administration Act of 1979 (50 USC App. §§2401 et seq.) or regulations thereunder. If such Contractor, or any of the aforesaid affiliates of the Contractor, is convicted or is otherwise found to have violated said laws or regulations upon the final determination of the United States Commerce Department or any other appropriate agency of the United States subsequent to the contract's execution, such contract, amendment or modification thereto shall be rendered forfeit and void. The Contractor shall so notify the Authority within five (5) business days of such conviction, determination or disposition of appeal.

8. SET-OFF RIGHTS. The Authority shall have rights of set-off. These rights shall include, but not be limited to, the Authority's option to withhold for the purposes of set-off any moneys due to the Contractor under this contract up to any amounts due and owing by the Contractor to the Authority with regard to this contract, or any other contract with the Authority, including any contract for a term commencing prior to the term of this contract, plus any amounts due and owing to the Authority for any other reason including, without limitation, monetary penalties, adjustments, fees, or claims for damages by the Authority and third parties in connection therewith.

9. RECORDS. The Contractor shall establish and maintain complete and accurate books, records, documents, accounts and other evidence directly pertinent to performance under this contract (collectively, "Records") for a period of six (6) years (or any other longer period required by law) following final payment or the termination of this contract, whichever is later, and any extensions thereto. The Authority, State Comptroller, State Attorney General and any other person or entity authorized to conduct an examination shall have access to the Records during normal business hours at an office of the Contractor within New York State, or, if no such office is available, at a mutually agreeable and reasonable venue within the State, during the contract term, any extensions thereof and said six (6) year period thereafter, for purposes of inspection, auditing and copying. As used in this clause, "termination of this contract" shall mean the later of completion of the work of the contract or the end date of the term stated in the contract. The Authority will take reasonable steps to protect from public disclosure those Records which are exempt from disclosure under State Public Officers Law §87 ("Statute") provided that: (i) the Contractor shall timely inform an appropriate Authority official, in writing, that said records should not be disclosed; (ii) said records shall be sufficiently identified; and (iii) designation of said records as exempt under the Statute is reasonable. Nothing contained herein shall diminish, or in any way adversely affect, the Authority's right to discovery in any pending or future litigation.

10. IDENTIFYING INFORMATION AND PRIVACY NOTIFICATION. All invoices or New York State standard vouchers submitted for payment for the sale of goods or services or the lease of real or personal property to the

Authority must include the payee's identification number, i.e., the seller's or lessor's identification number. The number is either the payee's Federal employer identification number or Federal social security number, or both such numbers when the payee has both such numbers. Failure to include this number or numbers may delay payment. Where the payee does not have such number or numbers, the payee, on its invoice or New York State standard voucher, must give the reason or reasons why the payee does not have such number or numbers.

The authority to request the above personal information from a seller of goods or services or a lessor of real or personal property, and the authority to maintain such information, is found in State Tax Law §5. Disclosure of this information by the seller or lessor to the Authority is mandatory. The principal purpose for which the information is collected is to enable the State to identify individuals, businesses and others who have been delinquent in filing tax returns or may have understated their tax liabilities and to generally identify persons affected by the taxes administered by the State Commissioner of Taxation and Finance. The information will be used for tax administration purposes and for any other purpose authorized by law.

The above personal information is maintained at the New York State Thruway Authority, Department of Finance and Accounts, P.O. Box 189, Albany, New York 12201.

11. EQUAL EMPLOYMENT OPPORTUNITIES FOR MINORITIES AND WOMEN. In accordance with State Executive Law §312, if this contract is: (i) a written agreement or purchase order instrument, providing for a total expenditure in excess of \$25,000, whereby the Authority is committed to expend or does expend funds in return for labor, services, supplies, equipment, materials or any combination of the foregoing, to be performed for, or rendered or furnished to the Authority; or (ii) a written agreement in excess of \$100,000 whereby the Authority is committed to expend or does expend funds for the acquisition, construction, demolition, replacement, major repair or renovation of real property and improvements thereon; or (iii) a written agreement in excess of \$100,000 whereby the owner of a State assisted housing project is committed to expend or does expend funds for the acquisition, construction, demolition, replacement, or major repair or renovation of real property and improvements thereon for such project, then the following shall apply and by signing this contract the Contractor certifies and affirms that it is Contractor's equal employment opportunity policy that:

(a) The Contractor will not discriminate against employees or applicants for employment because of race, creed, color, national origin, sex, age, disability, or marital status, and shall make and document its conscientious and active efforts to employ and utilize minority group members and women in its work force on Authority contracts and will undertake or continue existing programs of affirmative action to ensure that minority group members and women are afforded equal

employment opportunities without discrimination. As used in this clause, "affirmative action" shall mean recruitment, employment, job assignment, promotion, upgrading, demotion, transfer, lay-off or termination, and rates of pay or other forms of compensation.

(b) At the request of the Authority, the Contractor shall request each employment agency, labor union, or authorized representative of workers with which it has a collective bargaining or other agreement or understanding, to furnish a written statement that such employment agency, labor union or representative will not discriminate on the basis of race, creed, color, national origin, sex, age, disability or marital status, and that such union or representative will affirmatively cooperate in the implementation of the Contractor's obligations herein.

(c) The Contractor shall state, in all solicitations or advertisements for employees, that in the performance of this contract all qualified applicants will be afforded equal employment opportunities without discrimination because of race, creed, color, national origin, sex, age, disability or marital status.

The Contractor shall include the provisions of (a), (b) and (c) above in every subcontract over \$25,000 for the construction, demolition, replacement, major repair, renovation, planning or design of real property and improvements thereon except where such work is for the beneficial use of the Contractor. Section 312 does not apply to: (i) work, goods or services unrelated to this contract; or (ii) employment outside New York State. The Authority will consider compliance by a Contractor or its subcontractor with the requirements of any Federal law concerning equal employment opportunity which effectuates the purpose of this section. The Authority shall determine whether the imposition of the requirements of the provisions hereof duplicate or conflict with any such Federal law, and if such duplication or conflict exists, the Authority may waive the applicability of §312 of the Executive Law to the extent of such duplication or conflict. The Contractor shall comply with all duly promulgated and lawful rules and regulations of the Department of Economic Development's Division of Minority and Women's Business Development pertaining thereto.

12. CONFLICTING TERMS. In the event of a conflict between the terms of the contract (including any and all attachments thereto and amendments thereof) and the terms of this Appendix A, the terms of this Appendix A shall control.

13. GOVERNING LAW. This contract shall be governed by the laws of the State of New York except where the Federal supremacy clause requires otherwise.

14. LATE PAYMENT. Timeliness of payment and any interest to be paid to the Contractor for late payment shall be governed by State Public Authorities Law §2880 and 21 NYCRR Part 109.

15. NO ARBITRATION. Disputes involving this contract, including the breach or alleged breach thereof, may not be submitted to binding arbitration (except where statutorily authorized) but must, instead, be heard in a court of competent jurisdiction of the State of New York.

16. SERVICE OF PROCESS. In addition to the methods of service allowed by the State Civil Practice Law & Rules, the Contractor hereby consents to service of process upon it by registered or certified mail, return receipt requested. Service hereunder shall be complete upon the Contractor's actual receipt of process or upon the Authority's receipt of the return thereof by the United States Postal Service as refused or undeliverable. The Contractor must promptly notify the Authority, in writing, of each and every change of address to which service of process can be made. Service by the Authority to the last known address shall be sufficient. The Contractor will have thirty (30) calendar days after service hereunder is complete in which to respond.

17. PROHIBITION ON PURCHASE OF TROPICAL HARDWOODS. The Contractor certifies and warrants that all wood products to be used under this contract will be in accordance with, but not limited to, the specifications and provisions of State Finance Law §165 (Use of Tropical Hardwoods) which prohibits purchase and use of tropical hardwoods, unless specifically exempted, by the State or any governmental agency or political subdivision or public benefit corporation. Qualification for an exemption under this law will be the responsibility of the Contractor to establish to meet with the approval of the Authority.

In addition, when any portion of this contract involving the use of woods, whether supply or installation, is to be performed by any subcontractor, the prime Contractor will indicate and certify in the submitted bid proposal that the subcontractor has been informed and is in compliance with specifications and provisions regarding use of tropical hardwoods as detailed in State Finance Law §165. Any such use must meet with the approval of the Authority; otherwise, the bid may not be considered responsive. Under bidder certifications, proof of qualification for exemption will be the responsibility of the Contractor to meet with the approval of the Authority.

18. MACBRIDE FAIR EMPLOYMENT PRINCIPLES. In accordance with the MacBride Fair Employment Principles (Chapter 807 of the Laws of 1992), the Contractor hereby stipulates that the Contractor either (a) has no business operations in Northern Ireland, or (b) shall take lawful steps in good faith to conduct any business operations in Northern Ireland in accordance with the MacBride Fair Employment Principles (as described in State Finance Law §165), and shall permit independent monitoring of compliance with such principles.

19. OMNIBUS PROCUREMENT ACT OF 1992. It is the policy of New York State to maximize opportunities for the

participation of New York State business enterprises, including minority and women-owned business enterprises as bidders, subcontractors and suppliers on its procurement contracts.

Information on the availability of New York State subcontractors and suppliers is available from:

NYS Department of Economic Development
Division for Small Business
30 South Pearl Street – 7th Floor
Albany, NY 12245
Phone: (518) 292-5220
Fax: (518) 292-5884
<http://www.esd.ny.gov>

A directory of certified minority and women-owned business enterprises is available from:

NYS Department of Economic Development Minority and Women's Business Development Division
30 South Pearl Street – 2nd Floor
Albany, NY 12245
Phone: (518) 292-5250
Fax: (518) 292-5803
<http://www.esd.ny.gov>

The Omnibus Procurement Act of 1992 requires that by signing this bid proposal or contract, as applicable, the Contractor certifies that whenever the total bid amount is greater than \$1 million:

(a) The Contractor has made reasonable efforts to encourage the participation of New York State Business Enterprises as suppliers and subcontractors, including certified minority and women-owned business enterprises, on this project, and has retained the documentation of these efforts to be provided upon request to the Authority;

(b) The Contractor has complied with the Federal Equal Opportunity Act of 1972 (P.L. 92-261), as amended;

(c) The Contractor agrees to make reasonable efforts to provide notification to New York State residents of employment opportunities on this project through listing any such positions with the Job Service Division of the NYS Department of Labor, or providing such notification in such manner as is consistent with existing collective bargaining contracts or agreements. The Contractor agrees to document these efforts and to provide said documentation to the Authority upon request; and

(d) The Contractor acknowledges notice that the Authority may seek to obtain offset credits from foreign countries as a result of this contract and agrees to cooperate with the Authority in these efforts.

20. RECIPROCITY AND SANCTIONS PROVISIONS. Bidders are hereby notified that if their principal place of business is located in a country, nation, province, state or

political subdivision that penalizes New York State vendors, and if the goods or services they offer will be substantially produced or performed outside New York State, the Omnibus Procurement Act 1994 and 2000 amendments (Chapters 684 and 383, respectively) require that they be denied contracts which they would otherwise obtain. Contact the Department of Economic Development, Division for Small Business, 30 South Pearl Street, Albany, New York 12245, for a current list of jurisdictions subject to this provision. NOTE: As of October 2019, the list of discriminatory jurisdictions subject to this provision includes the states of South Carolina, Alaska, West Virginia, Wyoming, Louisiana and Hawaii.

21. NON-PUBLIC PERSONAL INFORMATION. The Contractor shall comply with the provisions of the New York State Information Security Breach and Notification Act (General Business Law §899-aa; State Technology Law §208). In addition to any relief or damages that may be imposed pursuant to the provisions of this Act, the Contractor shall be liable for the costs imposed upon the Authority which are associated with breach of the Act if caused by Contractor's negligent or willful acts or omissions, or the negligent or willful acts or omissions of the Contractor's agents, officers, employees or subcontractors.

22. IRAN DIVESTMENT ACT. In accordance with State Public Authorities Law §2879-c, if this is a contract for work or services performed or to be performed, or goods sold or to be sold, the Contractor subscribes and affirms, under penalty of perjury, that: by signing this contract, each person and each person signing on behalf of any other party certifies, and in the case of a joint bid or partnership each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief that each person is not on the list created pursuant to paragraph (b) of subdivision 3 of §165-a of the State Finance Law, entitled "Entities Determined to be Non-Responsive Bidders/Offerers pursuant to the New York State Iran Divestment Act of 2012" ("Prohibited Entities List") posted at: <https://ogs.ny.gov/list-entities-determined-be-non-responsive-biddersofferers-pursuant-nys-iran-divestment-act-2012>.

For the purposes of this clause, the term "person" shall be as defined in subdivision (1)(e) of §165-a of the State Finance Law.

Contractor further certifies that it will not utilize on this contract any subcontractor that is identified on the Prohibited Entities List. Contractor agrees that should it seek to renew or extend this contract, it must provide the same certification at the time the contract is renewed or extended. Contractor also agrees that any proposed Assignee of this contract will be required to certify that it is not on the Prohibited Entities List before the contract assignment will be approved by the Authority.

During the term of the contract, should the Authority receive information that a person (as defined in State Finance Law § 165-a) is in violation of the above-referenced certifications, the Authority will review such information and offer the person an opportunity to respond. If the person fails to demonstrate that it has ceased its engagement in the investment activity which is in violation of the Act within 90 days after the determination of such violation, then the Authority shall take such action as may be appropriate and provided for by law, rule, or contract, including, but not limited to, imposing sanctions, seeking compliance, recovering damages, or declaring the Contractor in default.

23. OBSERVANCE OF LAWS. The Contractor agrees to observe all applicable Federal, State and local laws and regulations, and to procure all necessary licenses and permits.

24. NO WAIVER OF PROVISIONS. The Authority's failure to exercise or delay in exercising any right or remedy under this contract shall not constitute a waiver of such right or remedy or any other right or remedy set forth therein. No waiver by the Authority of any right or remedy under this contract shall be effective unless made in a writing duly executed by an authorized officer of the Authority, and such waiver shall be limited to the specific instance so written and shall not constitute a waiver of such right or remedy in the future or of any other right or remedy under this contract.

25. ENTIRE AGREEMENT. This contract, together with this Appendix A and any other appendices, attachments, schedules or exhibits, constitutes the entire understanding between the parties and there are no other oral or extrinsic understandings of any kind between the parties. This contract may not be changed or modified in any manner except by a subsequent writing, duly executed by the parties thereto.

26. ADMISSIBILITY OF REPRODUCTION OF CONTRACT. Notwithstanding the best evidence rule or any other legal principle or rule of evidence to the contrary, the Contractor acknowledges and agrees that it waives any and all objections to the admissibility into evidence at any court proceeding or to the use at any examination before trial of an electronic reproduction of this contract, in the form approved by the State Comptroller, if such approval was required, regardless of whether the original of said contract is in existence.

27. CERTIFICATION OF REGISTRATION TO COLLECT SALES AND COMPENSATING USE TAX BY CERTAIN STATE CONTRACTORS, AFFILIATES AND SUBCONTRACTORS. To the extent this agreement is a contract as defined by Tax Law § 5-a, if the Contractor fails to make the certification required by Tax Law § 5-a or if during the term of the contract, the Department of Taxation and Finance or the Authority, as defined by Tax Law § 5-a, discovers that the certification, made under penalty of perjury, is false, then such failure to file or false certification shall be a

material breach of this contract and this contract may be terminated, by providing written notification to the Contractor in accordance with the terms of the agreement, if the Authority determines that such action is in the best interest of the Authority.

28. CONTRACT INVOLVING STEEL PRODUCTS. Contracts involving steel products are subject to Public Authorities Law § 2603-a, and steel products to be provided or incorporated by Contractor must be produced or made in whole or substantial part in the United States as set forth therein.