

*US CUSTOMARY UNITS*

**D263340**

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# **PROPOSAL**

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**Proposal Description:**

Route 374 - Dannemorra Water District #3  
(5.5 miles, waterline, pumping and re-chlorination station, minor pavement).

**Letting of 12/15/2016 @ 10:30 A.M.**

Submitted in accordance with the Highway Law and the Standard Specifications officially finalized and adopted on September 1, 2016 as posted on the Department's website.

**Book 2 of 2**



**Department of  
Transportation**

50 Wolf Road, Albany, NY 12232

## IMPORTANT BIDDER INFORMATION

**1. Familiarize Yourself with the Standard Specifications.** NYSDOT currently uses the Standard Specifications specified on the front cover of this Project Proposal. The applicable Standard Specifications may be accessed at: <https://www.dot.ny.gov/main/business-center/engineering/specifications/busi-e-standards-usc>. Be certain you access the correct edition of the Standard Specifications. .

**2. Upcoming Projects/ Letting Results/Contract Documents.** Advertisements are available at: [www.dot.ny.gov/doing-business/opportunities/const-highway](http://www.dot.ny.gov/doing-business/opportunities/const-highway) and Letting Results are at: [www.dot.ny.gov/doing-business/opportunities/const-results](http://www.dot.ny.gov/doing-business/opportunities/const-results). Contract documents may be accessed at: [www.dot.ny.gov/doing-business/opportunities/const-notice](http://www.dot.ny.gov/doing-business/opportunities/const-notice).

**3. Procurement Lobbying Law.** [www.dot.ny.gov/main/business-center/contractors/contractors-repository/lobbylaw.pdf](http://www.dot.ny.gov/main/business-center/contractors/contractors-repository/lobbylaw.pdf). NYS Finance Law restricts communication with NYSDOT personnel on procurements and contact can only be made with designated persons. Contact with non-designated persons or other involved Agencies will be considered a serious matter and may result in disqualification. Contacts are: Maria Tamarkin, Construction Letting & Award Unit, (518) 457-8403; the Assistant Director/Director, Contract Management Bureau, (518) 457-2124. Project related technical questions or comments must be submitted through the Contract Documents tab of the Department's website at: [www.dot.ny.gov/doing-business/opportunities/const-notice](http://www.dot.ny.gov/doing-business/opportunities/const-notice).

**4. D/M/WBE Goals.** [www.dot.ny.gov/main/business-center/contractors/construction-division/construction-civil-rights/ebo](http://www.dot.ny.gov/main/business-center/contractors/construction-division/construction-civil-rights/ebo). Projects may have one goal for participation by Disadvantaged Business Enterprises (DBE) when Federally funded, or two separate goals for participation by Minority Business Enterprises (MBEs) and Women's Business Enterprises (WBE), when Non-Federally funded. If the project has (a) D/M/WBE goal(s), you must document your good faith efforts to obtain D/M/WBE participation. Solicitation of D/M/WBEs must begin prior to the submission of your bid. For projects with goals, the Pre-Award Utilization Package must be submitted to the Office of Construction within 7 calendar days after Letting, in accordance with §102-12 *D/M/WBE Utilization*, using the current version of NYSDOT approved Civil Rights reporting software.

**5. Bonds.** Statutes require that a low bidder file both a Performance Bond and a Labor and Material Bond for the full amount of the contract. Arrangements should be made with a Surety prior to submitting a bid. Failure to secure bonding could result in the loss of your bid deposit. See §103-03 *Contract Bonds*.

**6. Bid Security.** Every bid must be accompanied by a bid bond, certified check or bank cashier's check payable to the State of New York. Bid Express bids must include an electronic bid bond. Bonds must be on form CONR 391 and in the sum of 25% of the total bid. Checks must be in the amount specified in the proposal.

**7. New York State Can Help You Secure Surety Bonding.** The NYS Surety Bond Assistance Program (NYSBAP) provides technical and financial assistance to help New York State small business or MWBE 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 visit [esd.ny.gov/BusinessPrograms/BondingAssistance.html](http://esd.ny.gov/BusinessPrograms/BondingAssistance.html) or contact Ms. Huey-Min Chuang at Empire State Development at 212-803-3238 or [BAP@esd.ny.gov](mailto:BAP@esd.ny.gov).

**8. Do Not Alter the Bid Proposal Unless Directed to Do So by Amendment.** Unauthorized alterations could lead to your bid being declared informal. See §102-05 *Proposal Submission*.

**9. The Contractor is responsible for ensuring that all Amendments have been incorporated into its bid.** Amendments are posted at: [www.dot.ny.gov/doing-business/opportunities/const-notice](http://www.dot.ny.gov/doing-business/opportunities/const-notice).

**10. Bid on All Items and Sign the Bid.** If it is your intent to bid "0", use the numeric symbol. Leaving blank spaces can render your bid informal. See §102-05 *Proposal Submission*.

**11. Bids Should Be Submitted through Bid Express or in a Sealed Envelope prominently labeled "BID ENCLOSED", addressed to NYSDOT, Contract Management Bureau, 50 Wolf Road, First Floor, Suite 1CM, Albany NY 12232 and delivered during normal business hours(Monday through Friday, 7:00 am to 4:00 pm). Clearly identify the Contractor Name, Address, Federal Identification Number, Project Number and Project Description on the envelope.** The same Federal Identification number should be used on both the envelope and the Planholders List. Low bidders must have a current NYS Vendor Responsibility Questionnaire For-Profit Construction (CCA-2) on file or submit one within 10 days of receipt of the contract. Questionnaires are available at: [www.dot.ny.gov/bids-and-lettings/construction-contractors/general-info](http://www.dot.ny.gov/bids-and-lettings/construction-contractors/general-info). Please call (518) 457-2421 if a reasonable accommodation is needed to participate in the Letting.

<b>REQUIRED CONTRACT PROVISIONS</b>
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D/M/WBE Utilization

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EEO Goals

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D/M/WBE Goals

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Form CONR 9k

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Electronic Bidding

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Federal Aid Contract Provisions

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Percentage Bid Items

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List of Additional Insured

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Railroad Insurance

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New York State Uniform Contracting Questionnaire

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*NOTE: This form was developed for repetitive use throughout all contract proposals and may identify items not applicable to this specific project.*

## GOALS FOR EQUAL EMPLOYMENT OPPORTUNITY (EEO) PARTICIPATION

### 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

### GOAL FOR PARTICIPATION OF WOMEN

The last publication of a goal for the participation of women was April 7, 1978 (43 FR 14888, 14900). Pursuant to 41CFR 60-4.6, the 6.9% goal published on that date is hereby made the goal for all contracts and grant agreements, until further notice.

## GOALS FOR DISADVANTAGED/MINORITY/WOMEN'S BUSINESS ENTERPRISE (D/M/WBE) PARTICIPATION

The Department has established the following utilization goal(s) for this contract, expressed as a percentage of the total contract bid amount. For clarification of Disadvantaged Business Enterprise (DBE) Utilization, Minority Business Enterprise (MBE) Utilization or Women's Business Enterprise (WBE) Utilization requirements refer to §102-12 *D/M/WBE Utilization* of the Standard Specifications.

Disadvantaged Business Enterprise (DBE) Utilization Goal	____ % (Federal-Aid Only)
Minority Business Enterprise (MBE) Utilization Goal	<u>12</u> % (Non Federal-Aid Only)
Women's Business Enterprise (WBE) Utilization Goal	<u>18</u> % (Non Federal-Aid Only)

Directories and/or Information related to the current certification status of Disadvantaged Business Enterprises can be obtained from the NYS Unified Certification Program website at:  
<http://biznet.nysucp.net>

Direct questions concerning Disadvantaged Business Enterprise Utilization to:

NYS Department of Transportation  
Office of Construction  
50 Wolf Road Pod 51  
Albany, New York 12232  
(518) 457-6472

Direct questions concerning Disadvantaged Business Enterprise Certification to:

NYS Department of Transportation  
Contract Audit Bureau  
DBE Certification  
50 Wolf Road, 6<sup>th</sup> Floor  
Avenue F, 1<sup>st</sup> Street  
Albany, New York 12232  
(518) 457-3180

Directories and/or information related to the current certification status of Minority and Women's Business Enterprises, can be obtained by contacting the:

NYS Department of Economic Development  
Division of Minority and Women's Business Development  
633 Third Avenue  
New York, NY 10017  
(212) 803-2414  
email: [mwbecertification@esd.ny.gov](mailto:mwbecertification@esd.ny.gov)  
<http://esd.ny.gov/MWBE/directorySearch.html>

**SUPPLEMENTAL INFORMATION AVAILABLE TO BIDDERS**

The information checked in the "Digital" column on this form is available at the Contract Documents tab within the Construction Contracting section of the [Business Center](#) on the Department's web site. The information checked in the "Inspection Only" column on this form is available at the Regional Office having jurisdiction for this project, as identified in the advertisement for bids, for inspection and review prior to 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:

**THERE IS NO SUPPLEMENTAL INFORMATION AVAILABLE FOR THIS CONTRACT:**



INFORMATION	Digital <sup>1</sup>	Inspection Only
1. Greyscale PDF of Sealed Plan Set (for printing) <sup>2,4</sup>	<input checked="" type="checkbox"/>	
2. Unsealed Layered or 3D PDF Files	<input type="checkbox"/>	
3. CADD Information		
a. MicroStation DGN	<input checked="" type="checkbox"/>	
b. InRoads DTM and XML format	<input checked="" type="checkbox"/>	
c. InRoads ALG and XML format	<input checked="" type="checkbox"/>	
4. Department of Corrections Security Requirements	<input checked="" type="checkbox"/>	
5. Quantity Work-ups <sup>3</sup>	<input checked="" type="checkbox"/>	
6. Record Plans	<input type="checkbox"/>	<input type="checkbox"/>
7. Rock Cores (available for inspection only)		<input type="checkbox"/>
8. Sign Face Layouts in ADOBE PDF format	<input type="checkbox"/>	
9. Stormwater Pollution Prevention Plan (SWPPP)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
10. Subsurface Information		
a. Subsurface Exploration Logs	<input checked="" type="checkbox"/>	<input type="checkbox"/>
b. Geotechnical Engineering Report	<input checked="" type="checkbox"/>	<input type="checkbox"/>
c. Laboratory Test Data from Soil Samples	<input type="checkbox"/>	<input type="checkbox"/>
d. Tabulated Results of Probing	<input type="checkbox"/>	<input type="checkbox"/>
e. Tabulated Depth to Bedrock	<input type="checkbox"/>	<input type="checkbox"/>
f. Rock Core Evaluation Logs	<input type="checkbox"/>	<input type="checkbox"/>
g. Compression Test Data from Rock Samples	<input type="checkbox"/>	<input type="checkbox"/>
h. Rock Outcrop Maps	<input type="checkbox"/>	<input type="checkbox"/>
i. Granular Materials Resource Survey Reports	<input type="checkbox"/>	<input type="checkbox"/>
j. Terrain Reconnaissance Reports	<input type="checkbox"/>	<input type="checkbox"/>
11. Subsurface Information - Other Information		
a. Subsurface information from outside sources	<input type="checkbox"/>	<input type="checkbox"/>
b. Source Information - Granular Material and aggregates	<input checked="" type="checkbox"/>	<input type="checkbox"/>
c. Special Subsurface Reports	<input type="checkbox"/>	<input type="checkbox"/>
12. Anticipated Construction Schedule	<input type="checkbox"/>	<input type="checkbox"/>
13. Asbestos Information		
a. Asbestos Blanket Variances	<input type="checkbox"/>	<input type="checkbox"/>
b. Asbestos Report	<input type="checkbox"/>	<input type="checkbox"/>
14. Special Reports or Other Information:		
a. Permits	<input type="checkbox"/>	<input type="checkbox"/>
b. Design Approval Document	<input checked="" type="checkbox"/>	<input type="checkbox"/>
c. Survey Control Report	<input type="checkbox"/>	<input type="checkbox"/>
d. Wetland Delineation Report	<input checked="" type="checkbox"/>	<input type="checkbox"/>
e. Basis-of-Design Report (Water System)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
f. DEC well decommissioning guide	<input checked="" type="checkbox"/>	<input type="checkbox"/>

<sup>1</sup> – All digital material is provided in ADOBE (PDF) format, unless noted above.

<sup>2</sup> – Required for all projects that have 11"x17" plan sets. See HDM Section 21.3.9.2

<sup>3</sup> – Required for all projects.

<sup>4</sup> – Greyscale PDF's of sealed plans must be provided at PS&E submittal. An updated version must be provided whenever the plans are modified or amended.

## **NYSDOT Electronic Bidding - Trns•port Expedite and Bid Express**

**Expedite** allows bidders to receive electronic proposal bid item information from the Department's web site and Bid Express to produce an electronic bid. Bidders need to enter unit prices only in the Schedule of Items. Expedite is provided free of charge, and can be used on almost any Windows-compatible PC. It integrates with many existing electronic bid preparation software packages, and has import/export capability for use with database and spreadsheet programs. Benefits may include:

- Bid data import takes seconds allowing users of computer systems that collect item data minimal time to construct bid files from "item libraries".
- Expedite calculates item and overall bid totals on-the-fly, as estimators work through the list, and alerts estimators if an item is accidentally omitted.
- Electronic files of item bid data will be posted to the NYSDOT website to coincide with advertising and contract document sale dates.
- Amended item bid data will be posted as soon as it is available. When it is downloaded, recognition of changes are automatic.
- The Department processes electronic bids much faster than paper bids decreasing the time needed for verification.

**Bid Express** allows secure, encrypted bid submittal over the internet. It integrates with Expedite and includes electronic bid bond verification. Bid Express is a fee-based service. Benefits may include:

- Real-time bid submittal from any location.
- No concerns about driving bids to Albany or mail services arriving after the deadline.
- Ability to submit a "safety bid" early while continuing to solicit better quotes from subs and suppliers and to overwrite the safety bid with a new bid right up to the submission deadline.
- As data accumulates on Bid Express, there is the ability to search and analyze bids on prior contracts for specific work items, by specific competitors, etc.
- Able to solicit and receive quotes from subcontractors through the Small Business Network on Bid Express.
- Contractors who use Bid Express do not submit a paper bid.

### **First time electronic bidders should:**

- Allow at least five business days to obtain a digital ID and password for bidding through Bid Express.
- Follow the procedures in "Expedite Instructions", which are posted at <http://www.dot.ny.gov/bids-and-lettings/construction-contractors/electronic-bid-system>
- Enter the Agency as NYSDOT.
- Use the appropriate Federal-ID and firm name. Federal-ID must be in the format 12-3456789. Joint ventures must create a new digital ID and send an authenticated copy of evidence of the authority of the agent or attorney-in-fact for the joint venturers to act on behalf of all joint venturers to the Contract Management Bureau prior to the Letting.

### **All electronic bidders should:**

- Enter prices for all bid items in the Schedule of Items.

## NYSDOT Electronic Bidding - Transport Expedite and Bid Express

- Enter days for the B portion(s) of A + B bids on the Proposal Sites folder (if applicable).
- Enter the required info in the JURAT and Disclosure of Lobbying Activity folders.
- Complete the Contract Document Bid-Ability Survey (optional).
- Enter the required info in the Bid Bond folder if submitting bid through Bid Express and click Verify to verify the bid bond.
- All folders should be green if submitting bid through Bid Express. Submitting a bid through Bid Express with any red folders could lead to your bid being declared informal.

**Paper Bid Documents:** NYSDOT recommends and encourages contractors to bid electronically with Bid Express because of its many advantages, but contractors are not required to bid electronically. If NYSDOT receives both a Bid Express bid and a paper bid from the same contractor, the Bid Express bid will prevail.

Bidders who do not use Bid Express are encouraged to submit an electronic bid file on a disk/CD included with their paper bid. NYSDOT will not accept electronic bids on disk/CD without a paper bid. If there is any discrepancy between an electronic file and the paper bid, the paper bid will prevail.

When submitting an electronic bid file with your paper bid, include only one file per bid. The disk/CD must be labeled with the following information:

- Firm name
- Letting date
- D number
- A statement as to whether the paper bid does or does not include any handwritten changes from the electronic bid file. Do not mix partial printouts with differing date-time groups.

**Amendments:** Contractors are solely responsible for recognizing and responding to changes by amendment. If an amendment involves changes to item bid data, an amended Expedite file will be posted to the Department's website and to Bid Express. This file must be applied to your electronic bid. If there is any discrepancy in the itemized proposals published in paper and electronic formats, in either the contract pay items or quantities, the Department will evaluate the bids based only on that portion that is common to all formats. For example, if an item is missing from any format, the bids will be evaluated excluding that item and if item quantities are different in any format, the bids will be evaluated using the lowest item quantity.

Please notify the Department at 888-664-9343 or 518-485-8111 if you find any such discrepancies. However, not all amendments will involve changes to item bid data.

### For assistance:

- Bid Express Help Desk (888) 352-2439 or (352) 381-4888
- NYSDOT Information Technology Division Help Desk (888) 664-9343 or (518) 485-8111
- Third-party Software - Contact the vendor of the software. The Department is neither authorized nor able to assist with any software package.

Last Update: February 2, 2012

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Per EI09007  
3/12/12



**SPECIAL NOTE  
ADDITIONAL INSURED PARTIES**

IN COMPLIANCE WITH SECTION "107-06 INSURANCE" OF THE STANDARD SPECIFICATIONS AND ANY APPROPRIATE REVISIONS, THE FOLLOWING PARTIES OWN OR OPERATE FACILITIES WITHIN THE HIGHWAY RIGHT-OF-WAY FOR THIS PROJECT:

**STATE OF NEW YORK/NEW YORK STATE DEPARTMENT OF TRANSPORTATION**

**NEW YORK STATE DEPARTMENT OF CORRECTIONS  
AND COMMUNITY SUPERVISION**

**CLINTON COUNTY**

**TOWN OF DANNEMORA**

**NEW YORK STATE ELECTRIC AND GAS**

**VERIZON NY, INC**

The above listing supplements Section 107-06 INSURANCE of the Standard Specifications.

Coverage must also be provided for any consultant inspecting engineer or inspector (and their agents) working for or on the project.

As the location(s) of work becomes known, the Engineer-In-Charge will call for the addition of Additional Insured Parties to the contractor's insurance requirements as specified in Section 107-06 A.4. of the Standard Specifications.

**SPECIAL NOTE**  
***INSURANCE COVERAGE***

By virtue of the scope, location, type, and/or estimated value, the following types of insurance, listed in the Standard Specifications §107-06B do not apply to this project and the Contractor is under no obligation to furnish proof of such insurance.

**Railroad Protective Liability Insurance is not required** because the project scope does not require work affecting any Railroads as described in §105-09.

**Marine Protection & Indemnity Insurance is not required** because the project scope does not require any Work performed on a navigable waterway using barges or other watercraft.

***BUILDERS' RISKS INSURANCE:***

- Builders' Risks Insurance is not required for this contract.

## New York State Uniform Contracting Questionnaire (CCA-2)

In accordance with §103-01 of the Standard Specifications, the NYS Department of Transportation requires that a review of a firm's responsibility be performed prior to the award of a contract or approval of a subcontract. A **New York State Uniform Contracting Questionnaire (CCA-2)** is the primary tool used to perform this review. A completed CCA-2 must be on file with NYSDOT to be considered for the award of a contract or for the approval of a subcontract. An approved CCA-2 covers NYSDOT work for 12 months from date of receipt.

Any low bidder who does not have a completed CCA-2 on file within ten days of receipt of a contract for execution may be subject to the forfeiture of the amount of the bid deposit pursuant to §103-02 of the Standard Specifications.

There are three CCA-2 options available on the NYSDOT website <https://www.dot.ny.gov/bids-and-lettings/construction-contractors/general-info>: online filing (VendRep), a Rich Text fillable form, and an Adobe Acrobat fillable form. No previous versions of the form will be accepted.

If a firm chooses to file online at [http://osc.state.ny.us/vendrep/popups/vendor\\_construction.htm](http://osc.state.ny.us/vendrep/popups/vendor_construction.htm) (site of the Office of the New York State Comptroller's VendRep repository), please note that the online VendRep System is only a repository of information with the Office of the State Comptroller (OSC). Although there is a certification completed in VendRep, it is only an electronic signature. This certification does NOT mean the CCA-2 has been reviewed and approved by any Agency. The firm **must** notify [vendorresponsibility@dot.ny.gov](mailto:vendorresponsibility@dot.ny.gov) by sending an e-mail stating that the online filing has been completed. This notification will initiate the review process. The firm cannot begin work for NYSDOT until a responsibility determination has been made by the Contract Management Bureau.

If choosing one of the other options, a firm **must print out and MAIL** its original, notarized CCA-2 to NYSDOT's Contract Management Bureau. Whichever format is used, all Attachments must be completed. A firm may use its own spreadsheets, but must provide all of the information requested. Either of the following may be substituted for an Attachment C: the firm's corporate balance sheet (including any Accountant's Notes or Reports referenced), or a copy of the Schedule L filed with its IRS Form 1120. Once all of the completed paperwork has been received, the approval process will begin. All responsibility checks must be completed by NYSDOT before a firm is approved to begin work.

Questions regarding the CCA-2 may be directed to the Contract Management Bureau, Vendor Responsibility Unit at (518) 457-1564.

## Location Maps

## Landscape Development Notes

R.O.W.Thruway

## Canal

## Funding

### Asphalt and Fuel Price Adjustments

### Specialty Items

### Other Special Notes

### Other Project Special Notes

*NOTE: This form was developed for repetitive use throughout all contract proposals and may identify items not applicable to this specific project.*

**SPECIAL NOTE****TEMPORARY LANE CLOSURE RESTRICTIONS FOR MAJOR HOLIDAYS****(2016, 2017, 2018 & 2019)**

There shall be no temporary lane closures on roadway facilities owned and/or maintained by NYSDOT on the major holidays listed below.

Exceptions can only be made under the following conditions:

- Emergency work
- Work within long-term stationary lane closures
- Safety work that does not adversely impact traffic mobility and has been authorized by the Office of Traffic Safety & Mobility

Construction activities that will result in temporary lane closures shall be suspended to minimize travel delays associated with road work for major holidays as follows:

**2016**

Labor Day - Monday, September 5.

Beginning 6:00 AM Friday, September 2 and ending 6:00 AM Tuesday, September 6.

Thanksgiving Day - Thursday, Nov. 24.

Beginning 6:00 AM Wednesday, November 23 and ending 6:00 AM Monday, November 28.

Christmas Day - Sunday, December 25.

Beginning 6:00 AM Friday, December 23 and ending 6:00 AM Monday, December 26.

**2017**

New Year's Day - Sunday January 1.

Beginning 6:00 AM Friday, December 30 and ending 6:00 AM Monday, January 2.

Memorial Day - Monday May 29.

Beginning 6:00 AM Friday, May 26 and ending 6:00 AM Tuesday, May 30.

Independence Day - Tuesday July 4.

Beginning 6:00 AM Friday, June 30 and ending 6:00 AM Wednesday, July 5.

Labor Day - Monday, September 4.

Beginning 6:00 AM Friday, September 1 and ending 6:00 AM Tuesday, September 5.

Thanksgiving Day - Thursday, Nov. 23.

Beginning 6:00 AM Wednesday, November 22 and ending 6:00 AM Monday, November 27.

Christmas Day - Monday, December 25.

Beginning 6:00 AM Friday, December 22 and ending 6:00 AM Tuesday, December 26.

**2018**

New Year's Day - Monday January 1.

Beginning 6:00 AM Friday, December 29 and ending 6:00 AM Tuesday, January 2.

Memorial Day - Monday May 28.

Beginning 6:00 AM Friday, May 25 and ending 6:00 AM Tuesday, May 29.

Independence Day - Wednesday July 4.

Beginning 6:00 AM Tuesday, July 3 and ending 6:00 AM Thursday, July 5.

Labor Day - Monday, September 3.

Beginning 6:00 AM Friday, August 31 and ending 6:00 AM Tuesday, September 4.

Thanksgiving Day - Thursday, Nov. 22.

Beginning 6:00 AM Wednesday, November 21 and ending 6:00 AM Monday, November 26.

Christmas Day - Tuesday, December 25.

Beginning 6:00 AM Friday, December 21 and ending 6:00 AM Wednesday, December 26.

**2019**

New Year's Day - Tuesday January 1.

Beginning 6:00 AM Friday, December 28 and ending 6:00 AM Wednesday, January 2.

Memorial Day - Monday May 27.

Beginning 6:00 AM Friday, May 24 and ending 6:00 AM Tuesday, May 28.

**SPECIAL NOTE**  
**Applicable Standard Sheets**

The “STANDARD SHEETS (US Customary Units) September 1, 2016 (Amended)” available at –

<https://www.dot.ny.gov/main/business-center/engineering/specifications/busi-e-standards-usc>

- shall be considered the latest revisions of the standard sheets maintained by the Department for the purposes of this contract.

**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 three different formats:

- Format 1. Pay items for a special specification will have five digits to the left of the decimal point and up to six digits to the right of the decimal point. The two left-most digits represent the origin of the specification. Reference Standard Specification §101-02 Specifications.
- Format 2. Pay items for a special specification will have three digits to the left of the decimal point and up to eight 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 3. Pay items for a special specification will have three digits to the left of the decimal point and up to eight 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

xxxxx.xx  
xxxxx.xxxx  
xxxxx.xxxxxx

## Format 2

xxx.xx xx  
xxx.xxxx xx  
xxx.xxxxxxxx

## Format 3

xxx.xx---xx  
xxx.xxxx--xx  
xxx.xxxxxxxx

**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 term "Contractor" is intended to mean both Prime Contractors and Subcontractors. Materials delivery vehicles not owned by the Contractor/Subcontractor are exempt from this requirement, but should minimize idling time at construction sites when ever possible.

The Contractor will be notified when any diesel powered construction equipment is in non-compliance. Non-compliance shall be corrected 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](http://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****Diesel Emission Reduction Act (DERA) Regulatory Compliance**

All Department Contractors and Subcontractors are made aware that Environmental Conservation Law (ECL) 19-0323 and 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 beginning in 2010 for regulated heavy duty diesel vehicles working on all State awarded contracts. DERA is a requirement of ECL, not a contractual requirement of NYSDOT. NYSDEC is responsible for regulatory enforcement. NYSDOT is responsible for annual Regulatory Entity reporting.

All Department Contractors and Subcontractors shall make determinations of regulatory applicability for vehicles in inventory used on active Department contracts beginning January 1<sup>st</sup> of every 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 and Subcontractors shall also quantify ULSD fuel used by regulated vehicles beginning with active contract work January 1<sup>st</sup> of every year.

An electronic copy of 6NYCRR Part 248 can be accessed at [www.dec.ny.gov/regulations/56222.html](http://www.dec.ny.gov/regulations/56222.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: [www.dec.ny.gov/chemical/4754.html](http://www.dec.ny.gov/chemical/4754.html).

DERA annual reporting by Department Contractors and Subcontractors shall be submitted to NYSDOT by April 1<sup>st</sup> of every year (all 2010 information to NYSDOT by April 1, 2011, all 2011 information to NYSDOT by April 1, 2012, etc.). Beginning in 2011 the following numbered 2010 information shall be submitted:

1. Contact information including firm name, contact person, phone number and e-mail
2. Annual total quantity of ULSD fuel used by covered vehicles on NYSDOT contracts
3. Annual fleet information for covered vehicles on NYSDOT contracts as provided in the following table:

-Number of on-road HDVs as defined in 248-1.1(b)(14) of 6NYCRR Part 248
-Number of off-road HDVs as defined in 248-1.1(b)(14) of 6NYCRR Part 248
-Number of bi-fuel HDVs as defined in 248-1.1(b)(3) of NYCRR Part 248
-Number of inventoried HDVs retired from your fleet prior to end of reporting year and not replaced
-Number of Alternative-fuel vehicles as defined in 248-1.1(b)(2) of NYCRR Part 248
-Number of HDVs that have been repowered/replaced with 2007 USEPA Diesel certified engines
-Number of HDVs that have been retrofitted with a USEPA or CARB approved device prior to 2/12/07
-Total number of regulated vehicles subject to BART requirements
-Total number of regulated vehicles with a BART device
-Number of NYSDEC approved waiver HDVs
-Total number of compliant vehicles
-Percentage of fleet meeting BART requirements as per 248-3.1(e) of 6NYCRR Part 248

Electronic mail submissions to [dera@dot.state.ny.us](mailto:dera@dot.state.ny.us).

### SPECIAL NOTE

#### OPTIONAL USE OF WARM MIX ASPHALT (WMA) TECHNOLOGIES

The contractor has the option of using an Approved WMA Technology in the production of all 402, *Hot Mix Asphalt (HMA)* items, except *SUPERPAVE HMA with Ice Retardant* items, *Waterproofing Bridge Deck HMA* items, and *Paver-Placed Surface Treatment* items, at no additional cost to the State.

If the contractor chooses to use a WMA technology, the provisions of §401 and §402 shall apply including the following:

Use an approved technology appearing on the Approved List for *Technologies for Warm Mix Asphalt*. Design a mixture using a WMA Technology in accordance with MM 5.16, *Superpave Hot Mix Asphalt Mixture Design and Mixture Verification Procedure*. At a minimum, a one point verification of the mixture's volumetric properties is acceptable for the following situations:

- When the WMA mix design is based on an existing Production Status HMA mix design.
- When the WMA mix design is based on, and utilizes a different WMA technology than, an existing Production Status WMA mix design.

Comply with the latest manufacturer's "Production, Testing, and Compaction Details" from the Approved List for incorporating the WMA technology. Test specimens may be made from plant produced or laboratory prepared WMA. Test specimens must be made from plant produced WMA if adding the WMA technology in the lab does not simulate the production process. The Regional Materials Engineer (RME) may require a State representative be present during the fabrication and testing. Submit the WMA design to the RME for review and verification at least 14 calendar days before production, including:

- Name of WMA technology and the target dosage rate.
- If using an additive other than water,
  - Submit a MSDS for the additive.
  - Submit either enough of the additive for the laboratory mix design verification, or the additive pre-blended in the PG Binder at the correct dosage. If the additive is not pre-blended into the PG Binder, include directions for properly incorporating the additive into the laboratory made mixture.
- Prior to the submission of any mix design, contact the RME to determine if there is an increased concern regarding the mixture's moisture susceptibility based on the WMA technology and/or the type of aggregate being used, or the performance of similar mixes. The RME may require AASHTO T 283 moisture susceptibility test results, meeting a minimum Tensile Strength Ratio (TSR) of 80%, as part of the mix design submission.

Submit Production Quality Control Plan revisions incorporating the WMA technology if not previously submitted.

For 80 Series Compaction Method, complete all breakdown roller passes before the mat temperature falls below 230° F, unless approved by the Director, Materials Bureau.

When the asphalt mixture is being placed over a *Sheet-Applied Waterproofing Membrane*, maintain a minimum delivery temperature in accordance with the Material Detail Sheets prepared by the membrane manufacturer.

### HMA WITH CRUSHED GLASS

**SCOPE.** This specification covers the requirements for the addition of crushed glass to hot mix asphalt mixtures. The provisions of Section 402 - Hot Mix Asphalt (HMA) Pavements applies except that the Contractor has the option of blending of the crushed glass in the following mixes:

- 37.5 HMA Base Course
- 25.0 HMA Binder Course
- 19.0 HMA Binder Course
- Truing and Leveling Course

If Contractor chooses the crushed glass option, the following modifications to the Standard Specifications shall apply:

### MATERIAL REQUIREMENTS

Crushed glass shall be subject to the approval of the Regional Materials Engineer prior to its use. The crushed glass shall contain no more than 1% (by weight) contaminants and shall meet the following gradation:

Sieve Size	Percent Passing
3/8 inch	100
1/4 inch	90-100
No. 30	0-20

Note: The gradation requirements may be modified upon approval by the Regional Materials Engineer.

Crushed glass may be included in the mixture up to 5%, maximum, of the total aggregate weight. The crushed glass, aggregate, and Performance-Graded Binder (PGB) shall meet the requirements specified in the Standard Specification §401-2.01 Hot Mix Asphalt Designs and §401-2.04 Performance-Graded Binder.

### CONSTRUCTION DETAILS

The crushed glass shall be proportioned from a separate feed bin approved by the Regional Materials Engineer. In addition, all requirements pertaining to aggregate shall apply to crushed glass including the equipment requirements for automatic proportioning and recording as stipulated for aggregate in §401-3.08.

**METHOD OF MEASUREMENT.** The provisions of §401-4 and §402-4, Method of Measurement, shall apply.

**BASIS OF PAYMENT.** The provisions of §402-5, Basis of Payment, shall apply.

## USE OF RECLAIMED ASPHALT SHINGLES (RAS) IN THE PRODUCTION OF ASPHALT MIXTURES

**DESCRIPTION.** The provisions below cover the use of Reclaimed Asphalt Shingles (RAS) in the production of asphalt mixtures. Sections 401 and 402 of the NYS Standard Specifications apply except as modified herein.

### MATERIAL REQUIREMENTS

The Contractor has the option of using the following:

- Manufactured Waste (MW) RAS may be used in shim, base, binder, and top courses (excluding 6.3 HMA Top Course, Waterproofing Bridge Deck Overlay, and Ice Retardant mixtures).
- Post Consumer Waste (PCW) RAS and may be used in shim, base and binder courses.

The RAS must be stockpiled at the plant facility and shall be subject to the approval of the Regional Materials Engineer (RME) prior to its use. RAS shall meet the following requirements:

- Shall be from a source that has obtained a beneficial use determination (BUD) from the NYS Department of Environmental Conservation (DEC) as specified in 6 NYCRR 360-1.15.
- Shall be certified to be asbestos free.
- Shall be completely free of nails. In addition, it shall contain no more than 1% by weight of other deleterious materials such as glass, wood, plastic, etc.
- Shall meet the following gradation:

Sieve Size	Percent Passing	
	Min.	Max.
¼ inch (6.3 mm)	100	-
#4 (4.75 mm)	90	100
#8 (2.36 mm)	75	90
#16 (1.18 mm)	50	70
#30 (0.600 mm)	30	55
#50 (0.300 mm)	15	40
#100 (0.150 mm)	5	25
#200 (0.075 mm)	-	15

The maximum RAS allowed in the mixture is 2% by weight of the total mixture. A Control Plan for using shingles in HMA shall be developed and submitted to the Regional Materials Engineer detailing the control and testing of the stockpiles. RAS shall be uniformly blended with RAP to reduce clumping and must be stockpiled separate from other stockpiles. Other methods of reducing RAS clumping can be utilized with the approval of the RME.

**Rejuvenator.** A rejuvenator shall be added to PCW RAS using a pugmill or similar equipment to pre-blend and stockpile the rejuvenated PCW RAS. Alternatively, a spray system may be used

## USE OF RECLAIMED ASPHALT SHINGLES (RAS) IN THE PRODUCTION OF ASPHALT MIXTURES

to spray the rejuvenator onto the PCW RAS prior to its introduction into the plant mixer. The rejuvenator shall meet the requirements of ASTM D 4552, *Standard Practice for Classifying Hot-Mix Recycling Agents*. Other liquid products or methods which facilitate softening of the PCW RAS binder may be used with the approval of the Regional Materials Engineer. The application rate shall be as recommended by the rejuvenator supplier.

**Mixture Design.** Prior to production of the HMA, the mixture design shall be developed to meet all the requirements in the latest Materials Method (MM) 5.16, *Hot Mix Asphalt (HMA) Mixture Design and Mixture Verification Procedures*, available on the Department's website. The mixture design shall also meet the performance test criteria listed in the table below. The testing must be performed by an AASHTO Materials Reference Laboratory (AMRL) approved laboratory that has the capability of performing these tests. When RAS is used in conjunction with RAP, the total percentage of reclaimed material shall not exceed the maximum of 20% for Top Course and Binder Course, and 30% for Base Course currently allowed under the specifications during the production of HMA.

**Mixture Performance Test Requirements**

Tests	Specification Criteria
Dynamic Modulus, AASHTO TP 79	Report
Flow Number, AASHTO TP 79	200, min.
Flexural Beam Fatigue, AASHTO T 321, 750 $\mu$ -Strains	10,000 cycles, min.
Overlay Tester, TxDOT TEX-248F	300 cycles, min.

**Reclaimed PG Binder Ratio:** The ratio of reclaimed PG binder from the RAP and RAS to the total PG binder content shall not exceed 0.2.

### CONSTRUCTION DETAILS

The provisions of Section 401 and Section 402 apply except that the RAP/RAS stockpile shall be tested at a frequency of at least once per day of production to determine the asphalt content and the gradation of the combined reclaimed material.

**D263340**  
**US CUSTOMARY FUEL PRICE ADJUSTMENT**

<b>FUEL PRICE ADJUSTMENT<sup>1</sup> CONVERSION FACTORS</b>		
<b>MATERIAL DESCRIPTION</b>	<b>CONVERSION FACTOR</b>	<b>ITEM NUMBER<sup>2</sup></b>
Unclassified Excavation	0.35 gal/yd <sup>3</sup>	203.02
Embankment	0.10 gal/yd <sup>3</sup>	203.03, 620.xx
Fill	0.45 gal/yd <sup>3</sup>	203.05, 203.06, 203.07, 203.08xx, 203.20, 203.21, 203.25
Controlled Low Strength Material	1.00 gal/yd <sup>3</sup>	204.01, 204.02, 204.03, 204.04
Trench/Culvert/Structure Excavation	0.50 gal/yd <sup>3</sup>	206.01, 206.0201
Bituminous Stabilized Course	1.40 gal/yd <sup>3</sup>	302.01, 307.01
Sub-base Course	1.00 gal/yd <sup>3</sup>	304 Items
Hot Mix Asphalt	2.50 gal/ton	402 Items <sup>3</sup> , 405.01, 608.020102 <sup>3</sup> , 619.0601 <sup>4</sup> , 624.02xxx <sup>3,4</sup> , 633.14 <sup>3,4</sup> , 633.15 <sup>3,4</sup> , 633.16 <sup>3,4</sup>
Milling	0.10 gal/yd <sup>2</sup>	490 Items
Portland Cement Concrete Pavement	1.00 gal/yd <sup>3</sup>	502 Items <sup>3</sup> , 503.1010, 503.1011, 503.1012
Fill Type Retaining Walls	0.45 gal/yd <sup>3</sup>	554.30xx <sup>5</sup> , 554.31 <sup>5</sup> , 554.4x <sup>5</sup>
Footing Concrete & Concrete for Structures - All classes	1.00 gal/yd <sup>3</sup>	555 Items, 582.05
Approach Slabs	0.33 gal/yd <sup>2</sup>	557.2001, 557.2002, 557.2003, 557.2009, 557.22
Structural Slabs with bottom formwork	0.25 gal/yd <sup>2</sup>	557.01xx, 557.07, 557.30
Structural Slabs - no bottom formwork	0.15 gal/yd <sup>2</sup>	557.05xx, 557.09
Class D Concrete	0.05 gal/yd <sup>2</sup>	557.13, 584 Items
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, 606.3004, 606.3024, 606.3034
Concrete Median Barrier, Single Slope	0.23 gal/ft	569.05, 606.3041, 606.3043, 606.3044
Concrete Median Barrier Wide, Single Slope	0.28 gal/ft	606.3051, 606.3053, 606.3054



**D263340**  
**US CUSTOMARY FUEL PRICE ADJUSTMENT**

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FUEL PRICE ADJUSTMENT <sup>1</sup> CONVERSION FACTORS		
MATERIAL DESCRIPTION	CONVERSION FACTOR	ITEM NUMBER <sup>2</sup>
Concrete Barrier Half Single Slope	0.17 gal/ft	569.04, 606.3061, 606.3063, 606.3064
Vertical Faced Concrete Parapet	0.10 gal/ft	569.03
Gravel, Stone, Slag	1.00 gal/yd <sup>3</sup>	411.01, 411.02, 411.03, 623.1x
Concrete Sidewalks and Driveways	1.00 gal/yd <sup>3</sup>	608.01xx
Topsoil	0.45 gal/yd <sup>3</sup>	610.10, 610.11xx, 610.14xx
<b>Notes:</b> <ol style="list-style-type: none"><li>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.</li><li>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.</li><li>3. Quality Adjustment Items (402/502/608/624) are not eligible for fuel price adjustment.</li><li>4. Fuel Price Adjustment Conversion Factor based on units of TONS of asphalt placed, not the pay units of this item.</li><li>5. Fuel Price Adjustment Conversion Factor based on units of CY of backfill paid under this item, not the pay units of this item.</li></ol>		

**D263340**  
**US CUSTOMARY ASPHALT PRICE ADJUSTMENT**

<b>ASPHALT PRICE ADJUSTMENT<sup>1</sup> CONVERSION FACTORS</b>		
<b>MATERIAL DESCRIPTION</b>	<b>CONVERSION FACTOR</b>	<b>ITEM NUMBER<sup>2</sup></b>
Bituminous Stabilized Course	0.065 t PGB/yd <sup>3</sup>	302.01
Asphalt Treated Permeable Base, Type 1	0.030 t PGB/t	402.010902
Asphalt Treated Permeable Base, Type 2	0.035 t PGB/t	402.011902
Shim Course	0.0825 t PGB/t	402.058902
6.3 SUPERPAVE HMA	0.067 t PGB/t	402.068xxx8 RR
9.5 SUPERPAVE HMA	0.062 t PGB/t	402.09xxx
12.5 SUPERPAVE HMA	0.055 t PGB/t	402.12xxx
19 SUPERPAVE HMA	0.049 t PGB/t	402.19xxx
25 SUPERPAVE HMA	0.045 t PGB/t	402.25xxx
37.5 SUPERPAVE HMA	0.040 t PGB/t	402.37xxx
Paved Placed Surface Treatment, Types A, B, and C	0.064 t PGB/t	415.01xxyy03
Micro-Surfacing, Quick-Set Slurry	0.078 t PGB/t	410.102102 RR, 410.103102 RR, 410.104102 RR, 410.202302 RR, 410.203302 RR
Straight Tack Coat	0.0026 t PGB/gal	407.0103
Asphaltic Sealants (ASTM 6690)	0.0027 t PGB/gal	402.75xx RR, 402.76xx RR, 402.76020018
Chip Seal	0.0027 t PGB/gal	410.0105006, 410.07
Asphalt Emulsion for Cold Recycling	0.0027 t PGB/gal	416.02xx
Fog Seal and Dilute Tack Coat	0.0016 t PGB/gal	407.0102, 416.04, 410.0106006
PG Binder for Cold Recycling	0.0043 t PGB/gal	416.03
Asphaltic Sealant – Clean & Seal	0.225 t PGB/LNMI	402.76030008, 412.76030001
Asphaltic Sealant – Treating Cracks	0.240 t PGB/LNMI	412.76040001
Asphaltic Sealant – Rout & Seal	0.270 t PGB/LNMI	402.76010008
Repair of HMA Pavement, Temporary Asphalt	See Note 4	633.14, 633.15, 633.16, 619.06xx
True and Leveling, Asphalt Sidewalks, Driveways, Bike Paths, Gutters	See Note 5	402.017902, 402.01890xxx, 608.020102, 624.02xx

**ASPHALT PRICE ADJUSTMENT<sup>1</sup> CONVERSION FACTORS**

**Notes:**

1. In accordance with Standard Specification §698-3.01, the index value for the asphalt price adjustment is the average posted price of Performance Graded Binder (PGB) 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 (402/608/624) are not eligible for asphalt price adjustment.
4. Asphalt Price Adjustment Conversion Factor based on units of TONS of asphalt placed, not the pay units of this item. The conversion factor for HMA Pavement Repair and Temporary Asphalt will be based on the actual asphalt mixture used.
5. The conversion factor for Truing and Leveling, Driveways, and other items that allow asphalt mix options, will be based on the actual mixtures used.
6. A two digit suffix (RR) at the end of a contract pay item indicates a special specification.
7. The conversion factors for HMA mixed with slag shall be increased by 25%.
8. t = tons

**SPECIAL NOTE****ALTERNATE BID ITEMS**

This Contract contains Alternate Designs for Water Pipe that must be bid on in accordance with this Special Note. The itemized proposal contains all items that can be bid, including alternate design items. Alternate design items are designated by an alternate item code included with the item description in the itemized proposal.

**ALTERNATE AA –ALTERNATE WATER PIPE DESIGN**

The Contractor will have the choice of bidding one of the two alternates for the water pipe and associated materials. Quantities for items unique to each alternate design shall be bid as follows:

**ALTERNATE AAA – PVC WATER PIPE**

ITEM 203.250000AA	SAND BACKFILL
ITEM 663.070400AA	POLYETHYLENE WATER SERVICE PIPE, 1"
ITEM 663.070600AA	POLYETHYLENE WATER SERVICE PIPE, 1 1/2"
ITEM 663.040400AA	PLASTIC WATER PIPE, 4"
ITEM 663.040600AA	PLASTIC WATER PIPE, 6"
ITEM 663.040800AA	PLASTIC WATER PIPE, 8"

**OR**

**ALTERNATE AAB – DUCTILE IRON WATER PIPE**

ITEM 203.070000AB	SELECT GRANULAR FILL
ITEM 623.120000AB	CRUSHED STONE (IN-PLACE MEASURE)
ITEM 663.060400AB	COPPER WATER SERVICE PIPE 1"
ITEM 663.060600AB	COPPER WATER SERVICE PIPE 1 1/2"
ITEM 663.010400AB	DUCTILE IRON CEMENT LINED WATER PIPE, 4"
ITEM 663.010600AB	DUCTILE IRON CEMENT LINED WATER PIPE, 6"
ITEM 663.010800AB	DUCTILE IRON CEMENT LINED WATER PIPE, 8"

The Contractor must bid on all alternate AAA items **or** all alternate AAB items.

**SPECIAL NOTE****ALTERNATE BID ITEMS**

Wherever AA or AB series items are used in this contract the corresponding specification item listed in the right column shall apply:

<b>PAY ITEM</b>	<b>SPECIFICATION</b>
ITEM 203.250000AA	ITEM 203.25
ITEM 663.070400AA	ITEM 663.0704
ITEM 663.070600AA	ITEM 663.0706
ITEM 663.040400AA	ITEM 663.0404
ITEM 663.040600AA	ITEM 663.0406
ITEM 663.040800AA	ITEM 663.0408
ITEM 203.070000AB	ITEM 203.07
ITEM 623.120000AB	ITEM 623.12
ITEM 663.060400AB	ITEM 663.0604
ITEM 663.060600AB	ITEM 663.0606
ITEM 663.010400AB	ITEM 663.0104
ITEM 663.010600AB	ITEM 663.0106
ITEM 663.010800AB	ITEM 663.0108

*Payment will be made under:*

Item No.	Item	Pay Unit
663.10060007	Air Release Valve Assembly	Lump Sum

**SPECIAL NOTE****OVERTIME**

When Department funds are allocated, the Department intends to have inspection resources available if the contractor desires to work overtime and has received permission to do so.

## SPECIAL NOTE

**OWNER REQUIREMENTS FOR WATER MAINS AND APPURTENANCES:**

The following are the requirements of the Owner of the water system for this contract. All manufacturer or proprietary material designations are the requirements of the Owner. Approval of an equal item other than that specified must be granted by the Owner.

Owner: **Town of Dannemora**  
 Address: **78 Higby Road**  
 City, State, ZIP: **Ellenburg Depot, NY 12935**  
 Contact: **Bill Chase** Phone #: **(518) 492-7541 ext.103**

The Owner requires review and approval of materials and details. The estimated time required for approval by the Owner of materials and details during construction is **5 days**.

**Water Pipe:**

Type of Material: **PVC** Pressure/Thick Class or DR: **DR 14 and DR 18**  
 Type of Joint: **Push-On with Rubber Gasket**

**Alternative Water Pipe:**

Type of Material: **Ductile Iron** Pressure/Thick Class or DR: **Thickness Class 52**  
 Type of Joint: **Push-On with Rubber Gasket**  
 Lining: **Cement – 1/8 inch minimum thickness**

Note: All fittings, couplings, and pipe restraint methods must utilize stainless steel nuts, bolts, rods and must be rated for the maximum working pressure of the water pipe.

**Directionally Drilled Water Pipe:**

Type of Material: **HDPE** Pressure/Thick Class or DR: **SDR 7 and SDR 9**  
 Type of Joint: **Butt-Fusion**

**Fittings:**

Type: **Compact Ductile Iron [C153]**

**Thrust Restraint Type:**

Horizontal Bends	<input checked="" type="checkbox"/> Restrained Joint, or	<input checked="" type="checkbox"/> Thrust Block or	<input type="checkbox"/> Retainer Gland or	<input type="checkbox"/> Tie Rod
Vertical Bends	<input checked="" type="checkbox"/> Restrained Joint, or	<input checked="" type="checkbox"/> Thrust Block or	<input type="checkbox"/> Retainer Gland or	<input type="checkbox"/> Tie Rod
Tees & Crosses	<input checked="" type="checkbox"/> Restrained Joint, or	<input checked="" type="checkbox"/> Thrust Block or	<input type="checkbox"/> Retainer Gland or	<input type="checkbox"/> Tie Rod
Valves	<input checked="" type="checkbox"/> Restrained Joint, or	<input checked="" type="checkbox"/> Thrust Block or	<input type="checkbox"/> Retainer Gland or	<input type="checkbox"/> Tie Rod
Hydrants	<input checked="" type="checkbox"/> Restrained Joint, or	<input checked="" type="checkbox"/> Thrust Block or	<input type="checkbox"/> Retainer Gland or	<input type="checkbox"/> Tie Rod

Note: The restrained joint and thrust block are recommended, but retainer gland may be necessary in certain applications.

**Tie Rods:**

Type: **Steel, Black – ASTM A307 Grade 2** Size: **See Standard Sheet 663.**

**Valves:**

Manufacturer: **Mueller**  
 Type: **Resilient Wedge**  
 Pressure Rating: **350 PSI**



Open:   X   Left (Counter-Clockwise) or        Right (Clockwise)

**Valve Boxes:**

Type: Slide-Type Adjustable

**Couplings:**

Type: Bolted Sleeve-Type

Note: Couplings that do not provide protection against pullout of pipe ends must be restrained in an approved manner by the Engineer.

**Retainer Glands:**

Type: Wedge-Type

Note: Retainer Glands must utilize a stainless steel pipe stiffening insert when used with High Density Polyethylene Pipe (HDPE).

**Service Connection Materials:***Service Pipe*

Material: Polyethylene Pressure Pipe

Connection Size: 1 in. and 1-1/2 in.

Note: For use with PVC Water Pipe

*Alternative Service Pipe*

Material: Copper Type K

Connection Size: 1 in. and 1-1/2 in.

Note: For use with Ductile Iron Water Pipe

*Fittings*

Manufacturer: Mueller

Type of Joint: Compression

*Corporation Stop*

Type: Ball or Ground Key

Connection Size: 1 in. and 1-1/2 in.

Manufacturer: Mueller

*Curb Stop*

Type: Mark II Oriseal

Connection Size: 1 in. and 1-1/2 in.

Manufacturer: Mueller

*Curb Box*

Type: Extension with Stationary Rod

Manufacturer: Mueller

Location: Highway Right-Of-Way Boundary

**SPECIAL NOTE****PG BINDER AND MIX DESIGN LEVEL**

Requirements of this note apply to all Section 402 and Section 404 Asphalt (HMA and WMA) items in this contract.

**PG BINDER**

Use a **PG 64S-22** (Standard) meeting the requirements of AASHTO M 332, *Standard Specification for Performance Graded Asphalt Binder using Multiple Stress Creep Recovery (MSCR)*, for the production of hot mix asphalt mixtures for this project. Terminal Blend Crumb Rubber modifier may be used for this PG binder.

When terminal blend CRM PG binder is used, the following shall apply:

- Crumb rubber particles shall be finer than #30 sieve size.
- The CRM PG binder shall be storage-stable and homogeneous.
- The Dynamic Shear Rheometer (DSR) shall be set at 2-mm gap.
- The CRM PG binder shall be 99% free of particles retained on the 600 µm sieve as tested in accordance with Section 5.4 of M 332.

Use of polyphosphoric acid (PPA) to modify the PG binder properties is prohibited for mixtures under this contract. This prohibition also applies to the use of PPA as a cross-linking agent for polymer modification.

**MOISTURE SUSCEPTIBILITY TESTING**

Any HMA mix design where the primary aggregate component by weight is granite or crushed gravel will be subject to moisture susceptibility testing by the producer during design, unless this requirement is waived by the RME. TSR testing may be required by the RME when there is a change to the asphalt binder source.

Moisture susceptibility will be determined by calculating the tensile strength ratio (TSR) of each specimen according to AASHTO T 283, Resistance of Compacted Asphalt Mixtures to Moisture-Induced Damage, except as modified in Section V.D. of NYSDOT Materials Method 5.16.

If the TSR of the HMA gyratory specimens is less than 80%, as required in AASHTO M 323, corrective action is required. Corrective action to improve the moisture susceptibility of the HMA mixture can include the use of anti-strip additives or blending of other aggregate materials to reduce the proportion of granite or gravel aggregates in the mix. When corrective action is necessary, any changes made to the design must be noted on the JMF, and all other volumetric and mechanical properties must be evaluated for compliance with NYSDOT Materials Method 5.16 using a one-point design. The results must be reported to the RME prior to production.

**MIX DESIGN**

The mixture designs must be developed in accordance with the criteria specified in the HMA items that are appropriate for an Estimated Traffic Level of <30.0 Million ESALs.

**Note:** The PG binder for this project may be modified with CRM additives to meet the requirements stated above. Handling of the HMA shall be discussed at pre-construction and pre-paving meetings.

**RAP PG BINDER CONTRIBUTION**

When greater than 10% of Recycled Asphalt Pavement (RAP) is utilized in the production of Hot Mix Asphalt (HMA) Top course, only 75% of the AC content of the RAP will be utilized in the final mix design calculation for the optimum asphalt content. The mixture design will be formulated such that all properties are within the criteria specified in the latest Material Method 5.16. The total asphalt content of virgin binder and the accepted RAP asphalt contribution shall not be less than the minimum asphalt content of the mix design during production.

**SPECIAL NOTE****ITEM 663.10010107 - PACKAGED BOOSTER PUMPING STATION****1 DESCRIPTION****1.01 General.**

- A. Under this item, the Contractor shall provide all labor, materials, equipment, and incidentals required to install a factory built, above-grade packaged booster pumping station, in accordance with these specifications and the contract plans, complete and ready to operate.
- B. The station shall include, but not be limited to, all the necessary internal piping, valves, flow meters, instrumentation, and appurtenances installed in a fabricated steel base and enclosed in a modular structure as shown on the contract Drawings and as specified herein. The station shall be complete when delivered to the site and will not require internal contractor construction except where indicated on the plans.
- C. Under this item, the work shall include, but is not limited to:
  - 1. Excavation for the station foundation and all necessary subgrade materials;
  - 2. Design and installation of the foundation, splash, door, and propane tank pads;
  - 3. Installation of packaged station as per the manufacturers requirements;
  - 4. Floor drain piping and pipeline connections;
  - 5. Coordination with the Town and MX Fuels for propane fuel tank delivery setup, and initial fill-up of the tank;
  - 6. Completion of all electrical and fiber optic service connections and raceway systems including conduit and wire, except that furnishing fiber optic cable shall be paid for under a separate item;
  - 7. As indicated on the contract plans and/or as specified herein.
- D. The Drawings are for the purpose of guidance and to show functional features and required external connections. They do not necessarily show all components necessary to accomplish the desired results nor do they necessarily show all components required to interface with the equipment. Exact equipment locations and raceway routing, etc. shall be governed by actual field conditions and/or instructions of the Engineer. The Contractor shall provide all parts, equipment, wiring, piping, and devices necessary to meet the functional requirements of the system.
- E. The Drawings are intended to show the general arrangement of the equipment including, but not limited to, pumps, motors, piping, fittings, valves, supports, wet well, and meter pit. They are not intended to show exact dimensions. Connection piping may have to be modified in order to accommodate the actual equipment furnished. The costs of such modifications are considered as being in the bid price and, therefore, no payment will be made for such modifications.
- F. Equipment and appurtenances vary by manufacturer. If modifications to the Drawings are required to change equipment configuration, piping, equipment supports or, appurtenances, the Contractor shall submit drawings stamped by a Professional Engineer who is licensed in the state of New York to the Engineer for approval. All related design and construction costs associated with any modifications will be the responsibility of the Contractor.

### 1.02 Codes and Regulations

- A. General: Comply with the latest recognized edition of the National Electrical Code (NEC) and all governing federal, state, and local laws, ordinances, codes, rules, and regulations. Where the Contract Documents exceed these requirements, the Contract Documents shall govern. In no case shall work be installed contrary to or below minimum legal standards.
- B. Utilities: Comply with all applicable rules, restrictions, and requirements of the utility companies serving the project site/facilities.
- C. Non-Compliance: Should any work be performed which is found not to comply with any of the above codes and regulations, provide all work and pay all costs necessary to correct the deficiencies.
- D. Arc Flash Program & Electrical Contractor shall have an OSHA compliance Arc Flash Safety Program.

### 1.03 References

- A. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified:
  - 1. American Water Works Association (AWWA).
  - 2. New York State Department of Health (NYSDOH).
  - 3. American National Standards Institute (ANSI).
  - 4. American Society for Testing and Materials (ASTM).
  - 5. National Electrical Code (NEC).
  - 6. National Electrical Manufacturer's Association (NEMA).
  - 7. National Electric Safety Code (NESC).
  - 8. Electric Testing Laboratory (ETL).
  - 9. Building Code of New York State (BCNYS).
  - 10. Insulated Cable Engineers Association (ICEA).
  - 11. Institute of Electrical and Electronic Engineers (IEEE).
  - 12. National Sanitation Foundation (NSF).
  - 13. Institute of Electrical and Electronic Engineers (IEEE).
  - 14. Steel Structures Painting Council (SSPC).
  - 15. Underwriter's Laboratories (UL)

### 1.04 Submittals

- A. Submit the following for approval:
  - 1. Manufacturer's information, specifications, and data showing dimensions, materials of construction, and weight of all major items of equipment. Mark each submittal to clearly indicate proposed product, options, finishes, etc.
  - 2. Installation diagrams showing location, arrangement, and size of all anchor bolts required for the equipment.
  - 3. Equipment, piping, and valve layout and schematic drawings.

4. Electrical Shop Drawings: Submit for all custom equipment and systems (e.g., panelboards) to be used on the project. Shop Drawings to be newly prepared, specifically for this project, and shall include all information listed in the Shop Drawings submittal requirements in the respective specification section. Include all pertinent information such as equipment/system identification, manufacturer, dimensions, nameplate data, sizes, capacities, types, materials, performance data, features, accessories, wiring diagrams, etc, in sufficient detail so as to clearly indicate compliance with all specified requirements and standards. For control systems, provide computer generated control ladder diagrams specifically developed for this project (standard diagrams not acceptable).
  5. Statement of compliance with ANSI/AWWA specifications.
- B. For information: Submit an Operation and Maintenance Manual as follows:
1. The station manufacturer and controls integrator shall provide an Operation and Maintenance Manual containing as built final system drawings, I/O listings, wiring diagrams, and operating and maintenance information.
  2. The submitted manuals shall be sufficient to facilitate the operation, removal, installation, programming, configuration, adjustment, calibration, testing and maintenance of each and all components and instruments.
- C. For information: Submit a station design stamped by a licensed Professional Engineer, registered in the state of New York. This submittal shall include structural calculations for the station structural components.
- D. For information: Submit a foundation design stamped by a licensed Professional Engineer, registered in the state of New York. This submittal shall include structural calculations for the concrete foundation, as well as door and splash pads.

### **1.05 Quality Assurance**

- A. The Owner shall receive a completely coordinated and properly integrated booster pump station for efficiency, ease in operation, and correct functional relationship among all elements of the system.
- B. Manufacturers Qualifications:
1. The manufacturer of this equipment shall be one recognized and established in the design and production of booster pump stations. The station manufacturer shall maintain regular production facilities at their place of business. These facilities shall be open for inspection by a representative of the Engineer/Owner/Contractor at any time during the construction and testing of the equipment covered under these specifications. As such, the station manufacturer shall be required to affix an Underwriter's Laboratories (UL) Label attesting to the compliance of that assembled equipment under the Packaged Pumping Systems (QCZJ) UL Listing Category. This label shall be inclusive of the entire station with enclosure so as to demonstrate compliance with the National Electrical Code requirements for working clearances and wiring procedures. Equipment manufactured without this third party certification label or equipment manufactured by an outside source or "brokered equipment" defined as systems not assembled on the premises of the named manufacturer by that company's employees will not be allowed.

2. A factory-authorized maintenance and parts facility shall be located within a 500-mile radius from equipment installation. The manufacturers shall show evidence of a parts inventory for all routine maintenance items associated with the supplied equipment.
- C. Installer's Qualifications: Firm with not less than five years' experience in the installation of electrical systems and equipment similar in scope and complexity to those required for this Project, and having successfully completed at least ten comparable scale projects.
- D. Certifications: Certify that the equipment installation is in accordance with manufacturer's instructions and recommendations.
- E. Incidental Work: Excavation, backfill, painting, patching, welding, carpentry, mechanical work, concrete pads and the like related to or required for work shall be performed by craftsman skilled in the appropriate trade, but shall be provided for under this item

#### **1.06 Inspections**

- A. General: During and upon completion of the work, arrange and pay all associated costs for inspections of all electrical work installed under this contract. The cost associated with electrical inspections, reports, shall be included in this item.
- B. Inspections Required: As per the laws and regulations of the local and/or state agencies having jurisdiction at the project site.
- C. Inspection Agency: Provide electrical inspection and report performed by third party inspection agency acceptable to the Authority and local utility provider. The report shall certify that the installation is in accordance with the contract documents and applicable codes.
- D. Certificates: Submit all required inspection certificates.
- E. Coordination: Coordinate inspections with the local utility.

#### **1.07 Delivery, Storage and Handling**

- A. Packing and Shipping: Deliver products in original, unopened packaging, properly identified with manufacturer's identification, and compliance labels.
- B. Storage and Protection: Comply with all manufacturer's written recommendations. Store all products in a manner which shall protect them from damage, weather, and entry of debris.
- C. Damaged Products: Do not install damaged products. Arrange for prompt replacement.

#### **1.08 Warranty**

- A. The equipment furnished under this Item shall be guaranteed to be free of defects in workmanship, design, and material. The Manufacturer shall replace, without cost to the Owner,

any equipment or part that is defective or shows undue wear, within one (1) year after the equipment has been placed into continuous, permanent operation.

- B. The Manufacturer shall include the services of a factory-trained representative to provide repair service for the equipment under this Item for a period of one (1) year from date that the equipment is placed into continuous, permanent operation. The cost of all replacement parts required during this one (1) year period shall be included.

## 2 **MATERIALS**

### 2.01 **Packaged Station**

Provide (1) packaged booster pump station as manufactured by the following:

1. Engineering Fluid, Inc., or approved equal.

### 2.02 **Building Enclosure**

- A. **General.** The station building enclosures shall be a factory assembled, modular structure of one (1) compartment all attached to the station base structure and requiring no additional assembly at the job site.
- B. **Design Criteria.** The building design criteria shall be:
  1. To withstand snow load based on ASCE 7-05 Ground Snow Loads for the Clinton County, New York.
  2. To withstand wind loads based on ASCE 7-05 for wind speeds.
  3. Be designed for site specific seismic requirements based on local conditions as dictated by the Available Ground Motion Parameters according to ASCE 7 and 2010 Building Code of New York State established by zip code and a live floor load of 125 PSF.
- C. **Sizing.** The modular building enclosing the station is shown at its minimum size so that National Standards mandated clearances are maintained above, below, and around equipment for proper and safe servicing, removal, and reinstallation of this equipment.

### 2.03 **Structure**

- A. **General.** All materials shall be specifically chosen to be resistant to moisture degradation and infestation and to be maintainable. The base substructure, building, and the means of attaching the building to the foundation shall be reviewed and stamped by a New York Registered Professional Engineer.
- B. **Insulation.** Insulation values for the walls and roof structure shall be a minimum R-21 in the walls and the roof. Insulation within the roof and wall panels shall be foam-in-place polyurethane material applied between the interior and exterior sheathing forming a closed cell bounded by the steel framing. The insulation shall have an ASTM E-84 flame spread index of 25 and smoke developed of 450.



- C. Framing.** Building framing materials shall comply with the A.I.S.I. Specification for the Design of Cold-formed Steel Structural Members and to Standards ASTM C-955, ASTM C-1007, ASTM C-645, ASTM C-754 and ICBO 4782P and 4784P. The building structure shall be fabricated using steel C-studs as wall framing members and C-joists for roof support.

Openings in the sidewalls and/or roof shall be as shown and be fully framed out and supported using single or multiple framing members sufficient to support and fasten those devices or equipment items requiring a framed opening, these being access hatches, HVAC equipment, pipe passages, conduit passages, door and window openings and other special purpose openings as might be shown and required. The attaching of devices or equipment to the building at a framed opening shall be done fully according to the device manufacturers mounting instructions.

**D. Sheathing.**

1. The exterior wall sheathing shall be 1/2" thick, exterior, CDX grade plywood.
2. The exterior roof sheathing shall be 5/8" thick, exterior, CDX grade plywood.
3. The interior wall and ceiling sheathing shall be 3/4" thick, exterior, CDX grade plywood.

- E. Mounting and Fastening.** The building shall be fabricated up from and securely attached to a framework fabricated of 2" x 6" steel tubing welded at each corner to form a base frame serving as a stable base for handling and transporting the building prior to attaching the building to the station base skid. The base frame shall be grit blasted to a SP-6 finish and coated with the specified coating material.

- F. Interior Surfaces.** All interior wall & ceiling surfaces shall be covered with .090" thick FRP (fiberglass reinforced plastic) sheeting of pebble grain, gloss, white finish. The individual wall faces shall be covered with one continuous sheet. The FRP sheets shall be glued to the gypsum sheathing requiring no fasteners. Corner moldings of like FRP material shall be installed & finished in a workmanlike manner.

- G. Exterior Surfaces.** Exterior wall surfaces of the building shall be covered with vinyl siding. The siding shall have a rich wood grain finish that resembles rough-sawn oak. The siding shall have double nailing hems and locks to hold the panel flat and secure against the wall. The vinyl shall be .044" gauge. Vinyl siding color shall be dark brown and selected by the Owner during the submittal phase. The station manufacturer shall provide direction to a color chart.

- H. Roof.** The roof shall be constructed to provide a shed-style, single slope roof. The minimum roof slope shall be 3:12. For review by the Engineer, the roof system shall be designed and stamped by a Registered Professional Engineer in the state of New York and provided with the equipment submittals.

- I. Building Substructure.** The base/floor system substructure shall be made up of steel plate and standard structural steel shapes of the sizes and weights sufficient to bear the loading placed on the base by shipping and operation. The substructure shall be designed to support the building live and dead loads plus the burden imposed by loading, transporting and unloading of this equipment.

All steel plates used in the substructure shall meet or exceed the requirements of ASTM-A36. The structural shapes (channels and angles) shall be of the thickness/weight as shown on the plans for

this item and shall meet or exceed the requirements for ASTM A-36. The structural rectangular or square tubing shall be of the wall gauge as shown on the plans for this item and shall meet or exceed the requirements for ASTM A-500 Grade B.

- J. Skid Insulation.** The steel skid underside shall be insulated with an isocyanurate (flame retardant urethane) foam insulating material. The insulation shall be applied in each of the spaces between the structural members and the interior perimeter of the skid by spray and other approved methods. The insulation shall be 2 inches thick and have a minimum density (compressibility) of 1.7-1.8 lbs/cu. ft. nominal. The insulation shall have an ASTM E-84 flame spread rating of less than 30.

**K. Corrosion Protection.**

1. General. All interior and exterior surfaces of the exposed steel structure, transmission piping, and fittings shall be grit blasted equal to commercial blast cleaning (SSPC-SP6).
2. Weldment Prime Coating. All weldments will be pretreated by hand to provide additional corrosion protection using the same product as the base coat. Following the pretreatment full coating application shall take place.
3. Base Coating. The base coating shall take place immediately after surface preparation. The protective coating shall consist of a two-component, high solids, high build, fast drying epoxy system for protection and finishing of steel and having excellent corrosion resistant properties. The epoxy system shall be self-priming and require no intermediate coatings.
4. Finish Coating. Following the base coating application, a full finish coating application shall take place. The protective coating shall consist of a two-component, high solids, high build, fast drying epoxy system for protection and finishing of steel and having excellent corrosion resistant properties. The epoxy system shall be self-priming and require no intermediate coatings. The base and finish coats shall provide a total dry mil thickness of 8.0 mils. Colors shall be in accordance with the NYS Department of Health requirements and shall be chosen by the Owner during the Shop Drawing phase.
5. Post Assembly Coating. Following assembly and just prior to shipping, there shall take place a thorough cleaning of the floor of the station followed by a rolled on coating of the two part epoxy coating to cover over any scuffing or scaring that might have occurred during assembly.

**2.04 Components**

- A. Heavy Duty Aluminum Doors.** Doors, single and double leaf and of the size shown on the plans, shall be manufactured of 18-gauge galvanized steel. All doors shall be full flush construction and 1-3/4 inches thick. Doors shall be reinforced, stiffened, insulated, and sound deadened with a solid polystyrene foam board permanently bonded to the inside of each face skin. The lock and hinge edge of each door shall be welded with a center hairline seam the full height of the door. Lock edge shall be reinforced full height by a 14-gauge continuous one-piece channel extruded templating. The hinge edge shall be reinforced full height by a 14-gauge continuous one-piece channel, formed and tapped for hinges. Top and bottom of the door shall be closed with 16-gauge channels. Doors shall be thoroughly cleaned and receive an iron phosphate treatment prior to receiving one coat of prime paint. Door closures and rim panics are reinforced with 14-gauge channels.

Doors shall be fully-mounted in frames produced for pre-hanging of commercial 1-3/4" doors. Frames are formed to 16-gauge commercial quality cold rolled steel conforming to ASTM A366 or A620 and A568. Frames are produced in two welded units, to be mechanically joined during installation. The base side is prepared for all required hardware. Both units, base and trim, are furnished with welded mitered faces. Frame anchoring includes compression anchors and stud screws. Door hinges shall be continuous gear hinges, fabricated of extruded 6063-T6 aluminum alloy/temper with pin-less assembly. The doors shall have a lockset, exterior handle, and top mounted-door closer with a hold-open device.

Doors and frames shall be finished with a two-component, aliphatic/acrylic polyurethane coating, white in color, with a high gloss finish. The coating shall be resistant to a wide range of solvents and chemicals under splash and spill conditions. The coating system shall be V.O.C. compliant.

- B. Floor Drain.** The station shall have floor drains as shown on the contract plans. The floor drains shall be a 4" grated opening with 4" I.D threaded hub for connection of a drain line up under the station floor. Plastic drain pipe and fittings shall conform to the material requirements of ASTM D1784 and shall be manufactured in accordance with ASTM D2241 for SDR 26 PVC pipe.
- C. Safety Floor Matting.** The walkway areas shall be covered with a rubber drainage runner. The runner shall be medium duty, 1/2 inch minimum thickness of open slot design allowing fluids to drain understanding or walking surfaces. The runner shall have a tread design to promote sure footing. The underside of the runner shall have a raised knob design to permit aeration and drainage, and to reduce runner fatigue. The runner shall not be glued to the floor.
- D. Restraining Points.** The main inlet and outlet piping to the station shall each be provided with two (2) or four (4) restraining points as welded on "eyes" or similar device welded to the underside of the base structure framing, or the capsule wall adjacent to the pipe penetration as shown to facilitate the attachment of joint restraint tie rods or other device to be used in retarding any pipe movement at the connections.
- E. Adaptors and Couplings.** All plumbed devices within the station eventually requiring service, such as meters, control valves, pumps and like equipment, shall be easily removed from the piping by the presence of appropriately placed and sufficient quantity of adaptors and couplings as shown on the plans; no less than the quantity of couplings and adaptors shown shall be allowed. The station piping shall include a variety of compression type, flexible couplings to prevent binding and facilitate removal of associated equipment. These couplings are to be where shown on the plans. In lieu of a compression coupling, a flanged coupling adapter (FCA) may be used. All compression couplings or flanged coupling adapters, and flexible connectors/expansion joints shall include a minimum of two (2) zinc coated steel threaded rods across the joint with appropriate bolted restraining points.
- F. Elastomer Pipe Connector.** The inlet side of each booster pump shall include an elastomer connector to help isolate vibration and noise in the piping system. The elastomer connector shall be of single sphere design, constructed of neoprene and nylon with bias-ply tire reinforcing cord to provide a 225 psi working pressure rating to a minimum of 120 degrees F. The elastomer connector shall pass through the plate steel flanges designed to grip the connector so the connector seals

without gaskets when the flange bolts are drawn up. A control joint limiting pipe connector movement shall be supplied with each pipe connector.

- G. Pressure Gauges.** Combination pressure gauges shall have a built-in pressure snubber and have 4-1/2" minimum diameter faces and turret style case, black fiberglass-reinforced thermoplastic with a clear acrylic window with Buna-N gasket. The gauge shall have a 1/4" MNPT lower mount process connection and contain a 0.6mm copper alloy restrictor. Gauge ranges shall be 0 to 300 psi for each of the inlet and outlet gauges for the station.

All gauges will be panel mounted off the pipeline and be connected to their respective sensing point. The gauge trim tubing shall be complete with both isolating and vent valves and the tubing shall be so arranged as to easily vent air and facilitate gauge removal. Gauges mounted directly to the pipeline or at the sensing point will not be accepted. Gauge ranges, markings and gauge location shall be identified in the submittal documents.

- H. Static and Sensing Lines.** All gauge, switch, and transmitter sensing lines shall be minimum 1/4" OD white polypropylene tubing run from the sensing point and a ball valve to the point of device mounting.

The pilot tubing shall be run in a workmanlike manner with elastomeric/stainless steel mounting straps to securely hold the tubing to be free of stress and vibration. The alignment and organization of the sensing lines shall be continuously rising.

- I. Sample Tap.** A single, right angle outlet, smooth nose, brass sample tap shall be affixed to the manual vent ball valve for the low suction lockout and suction pressure gauge assembly.
- J. Hose Bibb.** There shall be provided a standard hose bibb with valve and vacuum breaker on the suction piping. The hose bibb connection shall be through a pressure regulator.
- K. Strainers.** The pump station shall be equipped with three (3) line strainers. The strainer shall be ANSI Class 150 flanged rated for 250 psi operating pressure. The strainer body material shall be ANSI 16.42 Ductile iron with epoxy coating. The strainer shall be 316 stainless steel 10 mesh/2000 micron/0.078 inch openings. The cap hardware shall be stainless steel with a lid sealing gasket of Buna N.

1. Approved manufacturer:
  - a. Cla-Val Model X43H, or approved equal.

- L. Magnetic Flowmeter.** There shall be furnished a 3 inch electromagnetic flow meter suitable for fixed-site measurement of bi-directional flow in a full pipe. The flow meter shall consist of a flow tube and a flow transmitter, which shall transmit flow. The flow tube shall use a spool piece configuration with field-interchangeable sensors containing coils and electrodes.

Flow meter shall be a 3-inch Endress and Hauser Proline Promag 50W80, or approved equal. The meter is designed to hold the stated accuracy limits to two (2) upstream and five (5) downstream

pipe diameters of straight pipe length approaching and leaving the meter. The flow meter shall be rated for a maximum working pressure of 285 psi.

1. Flow Tube and Sensors. The spool piece flow tube shall be made of carbon steel and shall be powder coated with a corrosion resistant electrostatic epoxy finish inside and outside, and shall include Type 316 stainless steel bolts. O ring seals shall be made of Viton, and standpipe gaskets shall be made of nitrile rubber. The flow tube shall be supplied with ANSI 150 flanges.

Each flow sensor shall contain a coil, a pair of sensing electrodes, and an integral grounding electrode. External grounding rings and straps shall not be necessary. The sensors shall use solid state design, with the coils, electrodes, and other sensor components encapsulated in fluoride PVDF. The sensors shall be field replaceable and field-interchangeable without the need for recalibration. The electrodes shall be made of Type 316 stainless steel. The flow tube and sensors shall be permanently submersible to NEMA 6P (IP68) to 33 feet (10 m). A preamplifier shall be provided on the flow tube.

2. Flow Transmitter. The flow transmitter shall be microprocessor-based, and shall contain a keypad and a 2 line, 32 character, backlit alphanumeric liquid crystal display (LCD) with characters 0.3 in. (8 mm) high and 0.2 in. (5 mm) wide. The LCD shall visually prompt the user through the programming sequence, and the flow transmitter shall include a built-in help system. The LCD shall display flow rate and/or total flow in user-selectable units of measure. The flow transmitter shall be capable of displaying forward, reverse, net and grand total flows, and the totalizers shall be resettable or non-resettable.

The flow transmitter shall be housed in a rugged, watertight, dust-tight, corrosion resistant (NEMA 4X and IP67) cast aluminum, epoxy painted enclosure suitable for conduit connections. The enclosure shall include a clear polycarbonate window for viewing the LCD without opening the enclosure.

The wiring from the flow transmitter to the sensors shall be 3 separate 2-conductor cables, 18 gauge, twisted and shielded. All wiring from the flow transmitter to the sensors shall be provided and sized to reach from the flow tube to the flow transmitter without splices. The flow transmitter shall be wall mountable.

- M. Bladder Surge Tank.** The station shall be complete with an ASME approved bladder type surge tank, as shown in the plans. The storage tank volume shall be 211 gallons and rated for a maximum working pressure of 500 psi.

The surge tank shall feature deep drawn steel upper and lower domes with side shell construction specifically designed for bladder type storage tanks. Storage tank welding shall be carefully done to eliminate rough spots and sharp edges. The storage tank base shall be designed so as to permit free airflow to prevent moisture from accumulating beneath the storage tank.

The surge tank shall have a heavy-duty butyl bladder that effectively separates the air chamber from the water chamber. The shape of the bladder shall conform exactly to the shell configuration and shall be of seamless construction meeting FDA requirements for potable water. The bladder shall be replaceable.

1. Approved manufacturer:
  - a. AA Tanks SSA-800-E, or approved equal.

## 2.05 Booster Pumps

- A. General.** Provide three (3) in-line vertical pumps manufactured by Grundfos MPC-E 3CRE32-7-2 or approved equal. Pumps shall meet the following requirements:
1. Design Point – One Pump: 140 GPM @ 510' TDH
  2. Maximum Design Point – Two Pumps: 280 GPM @ 510' TDH
  3. Shut Off head: 610 feet
  4. Net Positive Suction Head: 8 feet
  5. Pump Efficiency @ Design Point: 75% minimum
  6. Pump Power: Non-overloading for 30 hp
  7. Motor Speed: 3,600 rpm nominal
- B. Type.** The booster pumps shall be of the vertical centrifugal diffuser type, multi-stage, and designed specifically for low flow-high head operation. The head-capacity curve shall have a steady rise in head from maximum to minimum flow within the preferred operating region. The shut-off head shall be a minimum of 20% higher than the head at the best efficiency point.
- C. Features.** The pump impellers shall be secured directly to the smooth pump shaft by means of a split cone and nut design. The suction/discharge base shall have ANSI Class 250 flange connections in a slip ring (rotation flange) design. The shaft seal replacement shall be possible without removal of any pump components other than the coupling guard, motor couplings, motor and seal cover. The entire cartridge shaft seal shall be removable as one piece component. Pumps shall have adequate space within the motor stool so that shaft and seal replacement is possible without motor removal.
- D. Materials.** The pump suction/discharge chamber, motor stool and pump shaft coupling shall be constructed of cast iron. The impellers, pump shaft, diffuser chambers, outer discharge sleeve, and impeller seal rings or seal ring retainers shall be constructed of stainless steel. The impellers shall be secured directly to the pump shaft by means of a stainless steel tapered split cone and locking nut. Intermediate and lower shaft bearings shall be Tungsten Carbide and Ceramic or Silicon Carbide. Pumps shall be equipped with a high temperature mechanical balanced cartridge seal assembly with Silicon Carbide/Silicon Carbide seal faces mounted in stainless steel seal components with EPDM or Viton elastomers.
- E. Support Stands.** The pump support stands shall be weld fabricated of structural and plate steel with double "H" configuration of solid, continuous legs and double webbing between the legs for rigidity. The base of the legs shall be flanged and continuously welded to the steel floor.
- F. Pump Motor.** The pump driver shall be a NEMA Design B, three phase, alternating current, (squirrel cage) induction motor, continuous duty rated, with motor insulation as Class F for Class B Heat Rise. Motor efficiencies shall be Premium Efficient as stated in NEMA MG 1, 2011 Part 12, Table 12-12 for the motor enclosure, open or closed.

Motor Service factor shall be 1.15 on the nameplate, reduced to 1.0 when used with variable frequency drives per NEMA MG 1 – 2011, Part 31.3.7. The motor enclosure shall be Totally Enclosed Fan Cooled (TEFC). Motors of 600 volts or less shall meet the requirements of NEMA MG 1 2011 Part 31.4.4.2 for ability to sustain voltage spikes when used with variable frequency drives under usual conditions. These motors are for use with variable frequency drives.

## 2.06 Piping

- A. Internal Piping.** Piping supplied by manufacturer shall be steel and conform to material specification ASTM A-53(CW) for nominal pipe size four (4) inch and smaller and ASTM A-53(ERW) Grade B for nominal pipe size five (5) inches and larger. Steel butt-welding fittings shall conform to material specification ASTM A-234 Grade WPB and to the dimensions and tolerances of ANSI Standards B16.9 and B16.28 respectively. Pipe and fittings shall conform to the requirement of AWWA C208 and shall be coated and lined in conformance with AWWA C205.

Forged steel flanges shall conform to material specification ASTM A-105 Class 60 and/or ASTM A-181 for carbon steel forgings and to the dimensions and tolerances of ANSI Standards B16.5 as amended in 1992 for Class 150 flanges. Pipes 10 inch and smaller shall be Schedule 40.

- B. Buried Piping.** Piping supplied by Contractor shall be ductile iron pipe conforming to the requirements of ANSI A21.51 and have a wall thickness Class 52. Fittings shall be cast or ductile iron conforming to ANSI/AWWA C153/A21.53 and utilize mechanical joints in accordance with ANSI/AWWA C111/A21.11. All ductile iron pipe and fittings shall be furnished with a seal coated double thickness cement mortar lining of 1/8 inches conforming to ANSI/AWWA C104/A21.4. Pipe zone bedding shall be select granular fill in accordance with Section 203 *Excavation and Embankment* and Section 663 *Water Supply Utilities* for ductile iron pipe.

- C. Interior Coating.** The internal surfaces of piping to be fusion bonded coated shall be grit blasted to an SP-10 finish with the finish profile required by the coating material manufacturer. The internal, wetted surfaces of the steel transmission piping shall have applied to it a Fusion Bonded Epoxy Coating on the interior pipe surface. The coating shall be applied and meet the testing requirements of AWWA C213. The powder coating product shall be National Sanitation Foundation (NSF) Standard 61 certified material. The epoxy powder coating shall be Tnemec Series FC20 or approved equal.

Prior to shipment of the station, the station manufacturer shall provide in writing to the Engineer certification that the fusion bonded epoxy coating has been applied to all internal surfaces of the steel piping using the proper method. Said certification shall show under the station manufacturer's letterhead:

1. Date of application.
2. Material Manufacturer and product designation including a product data sheet for the coating.
3. Applier of the fusion bonded coating, name, address and phone number.
4. Notarized signature of an officer of the station manufacturing company stating the fusion bonded epoxy coating was applied to AWWA Standard C213-91 or the latest revision.

- D. Floor Penetrations.** Where suction and discharge piping, or any other pressure piping, passes through the station floor plate and base sub-structure, that area of the floor shall be provided with a grout sleeve made up of steel pipe of 9" height and of sufficient annular diameter to pass a full size pipe flange for the pipe size shown.

The steel sleeve shall be welded into the floor plate with a 1" projection above the floor in the station. Following installation of the inlet and outlet pipes, the installing Contractor shall be responsible for furnishing and installing grout to close the opening around the installed pipe.

- E. Wall Penetrations.** Where transmission pipes pass through walls, the passage shall be by having the pipe with a weld sleeve pass through and be welded to a steel plate. The pipe passage plate shall extend down and be welded to the floor.

The pipe passage plate shall have welded to it on the three sides a channel iron frame which shall accept the building wall set into the channel flanges to lap over the building wall. Where the flange overlaps the building wall, the edge of the channel flange shall be caulked to the wall on all three edges on both sides of the wall.

## 2.07 Pipe Supports

- A. General.** Pipe supports by minimum sizing:

1. 8 inch or less piping shall be 2" x 3" x 3/16" wall rectangular tubing.
2. 10" and larger piping shall be 3" x 4" x 1/4" wall rectangular tubing.
3. 6 inch or larger piping shall be provided with "kick" bracing projecting fully from the underside of the pipe to the floor at an angle of no less than 15° from vertical out at a right angle to the run of the pipe being supported. These "kick" braces shall be in addition to the vertical pipe supports called out above.

- B. Riser Pipe Vertical Supports.** All of the inlet and outlet vertical riser pipes shall be provided with two (2) structural steel angle pipe supports welded from the floor to weldment plates on the vertical pipes. These supports shall be opposed by at least 120° around the pipe. The minimum member size for these supports shall be 3"x 4" x 1/4" tubular steel.

- C. Welding.** Pipe supports are to be fully welded at both end points to the pipe and steel floor where required. Where components are to be supported and may require disassembly at some time, the supports for these components shall be welded at the bottom and bolted at the top by use of a bolt yoke welded to the top of the support and bolted into the flange connection picking up at least three bolts.

## 2.08 Valves

- A. General.** All valves shall be certified to NSF/ANSI 61, Drinking Water System Components – Health Effects, and certified to be Lead-Free in accordance with NSF/ANSI 372. All valves shall conform to all applicable AWWA standards.

- B. Ball Valves.** For piping of less than 3" size, ball valves shall be used. The ball valves shall meet or exceed ASTM Spec B124 No. C37700. The ball valves shall be 2-piece forged brass body, blow



out proof stem, TFE seats, TFE packing with adjustable stem packing gland. The valves shall be NPT threaded pattern complete with lever operators. Maximum working pressure shall be 600 psi.

- C. Butterfly Valves.** Butterfly valves shall conform to the requirements of AWWA C504. The body shall be constructed of Ductile Iron ASTM A536 Gr. 65-45-12, with flanged end connections drilled in accordance with ANSI B16.1, Class 250, or mechanical joint ends drilled in accordance with AWWA C111. The body wall thickness shall be in strict accordance with AWWA C504. Table #1, for gray iron 250B valves.

The disc shall utilize an on-center shaft and symmetrical design, cast from Ductile Iron ASTM A536 Gr. 65-45-12. The disc edge shall be stainless steel type 316. Discs shall be retained by pins that extend through the full diameter of the shaft. The pin material shall be the same as the shaft material. Torque plugs or tangential fasteners shall not be allowed.

The shaft shall be made of ASTM A-564 Type 630 condition H-1150. The shaft seals shall be “V” type packing. Shaft seals shall be of a design allowing replacement without removing the valve shaft. No O-ring or “U” cup packing shall be allowed. The bearing shall be a stainless steel backed teflon material. Bearing load shall not exceed 1/5 of the compressible strength of the bearing or shaft material.

Manual actuators shall be of the traveling nut, self-locking type and shall be designed to hold the valve in any intermediate position between fully open and fully closed without fluttering or creeping. The actuator shall have mechanical stops that will withstand an input torque of 450 lb./ft. against each stop. Manual actuators shall conform to AWWA Standard C504 and shall be Pratt MDT or an approved equal.

1. Approved manufacturer:
  - a. Pratt HP350, or approved equal.

- D. Silent Check Valves.** Silent check valves shall conform to the requirements of AWWA C508, shall be wafer style, non-slam, for ANSI Class 250/300 flanges, and rated to a working pressure of 500 psi. Sizes shall be as specified on the plans. The body of the check valve shall be cast iron. The plug and seat shall be bronze and conform to ASTM Designation B-584. The seat shall contain a Buna-N seal to provide zero leakage. The seal design shall provide for both a metal to metal low and high pressure without over-loading or damaging the Buna-N seal. The guide bushings shall be bronze copper alloy and conform to ASTM Designation B-584. The valve spring and seat retainers shall be stainless steel and conform to ASTM Designation A-313. The valve plug shall be guided at both ends by a center shaft integral with the valve plug. Alignment of the center shaft shall be provided by guide bushings.

1. Approved manufacturer:
  - a. Val-Matic Model 1400A, or approved equal.

- E. Double Check Valve Backflow Preventer.** Double check valve backflow preventers shall be installed at the referenced cross-connection to prevent the backflow of water and conform to the requirements of AWWA C510. The cross-connections shall be determined by local inspection authority for use where a high hazard situation does not exist. Valve shall feature modular check

assemblies with center stem guiding. Each check module shall have a captured spring and be accessible through a bolted cover plate. Seats shall be replaceable without special tools. It shall be a complete assembly including tight-closing resilient seated shutoff valves, test cocks, and a strainer is recommended.

1. Approved manufacturer:
  - a. Watts Model 709 LFNRS, or approved equal

**F. Pressure Relief Valve.** Pressure relief valves shall conform to the requirements of AWWA C530. The valve configuration as shown shall be hydraulically operated, single diaphragm actuated. The valve shall consist of three major components: the body with seat installed, the cover with bearing installed, and the diaphragm assembly. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve, separating operating pressure from line pressure. Packing glands and/or stuffing boxes are not permitted and there shall be no pistons operating the main valve or pilot controls. Valve body and cover shall be epoxy coated. The stainless steel seat with integral bearing shall be of the solid, one piece design.

The diaphragm assembly shall contain a non-magnetic stainless steel stem of sufficient diameter to withstand high hydraulic pressures. The stem shall be fully guided through its complete stroke by a removable bearing in the valve cover and an integral bearing in the valve seat. No center guides shall be permitted. The stem shall be drilled and tapped in the cover end to receive and affix such accessories as may be deemed necessary.

The flexible, non-wicking, FDA approved diaphragm shall consist of nylon fabric bonded with synthetic rubber compatible with the operating fluid. The diaphragm shall be fully supported in the valve body and cover by machined surfaces which support no less than one-half of the total surface area of the diaphragm in either the fully open or fully closed position.

The pilot control system shall include CK2 isolation valves. The pilot system shall include closing speed control on all valves. Pilot controlled sensing shall be upstream of the pilot system strainer so accurate control may be maintained if the strainer is partially blocked.

The pressure relief pilot shall be a direct-acting, adjustable, spring-loaded, diaphragm valve designed to permit flow when controlling pressure exceeds in the adjustable spring setting. The pilot control is normally held closed by the force of the compression on the spring above the diaphragm and it opens when the pressure acting on the underside of the diaphragm exceeds the spring setting. The pressure relief valve shall be supplied with the Dura-Kleen® stem (KD option).

1. Approved manufacturer:
  - a. Cla-Val Model 50-01, or approved equal.

**G. Combination Air Vacuum Release Valves.** Combination air valves shall conform to the requirements of AWWA C512. Air valves shall be of the single housing style that combines the operating features of both an air/vacuum and air release valve and be placed as shown on the drawings and of the size shown.

The air/vacuum portion shall automatically exhaust large quantities of air during the filling of the pipeline and automatically allow air to re-enter the pipeline when the internal pressure of the pipeline approaches a negative value due to column separation, draining of the pipeline, power outage, pipeline break, etc. The air release portion shall automatically release small pockets of air from the pipeline while the pipeline is in operation and under pressure.

The combination air valve shall be 1" NPT inlet and outlet connections and a 5/64" diameter orifice for a minimum working pressure of 300 psi. The materials of construction shall be: body, cover and baffle of cast iron; float and all other trim shall be of stainless steel with the exception of the Buna-N seat and adjustable viton orifice button.

1. Approved manufacturer:
  - a. Val-Matic Model 201C, or approved equal.

## 2.09 Interior Electrical.

- A. Design, Assembly and Test.** The electrical apparatus and control panel design, assembly, and installation, and the integration of component parts will be the responsibility of the manufacturer of record for this equipment. That manufacturer shall maintain at his regular place of business a complete electrical design, assembly and test facility to assure continuity of electrical design with equipment application. Control panels designed, assembled or tested at other than the regular production facilities or by other than the regular production employees of the manufacturer of record for this booster pumping equipment will not be approved.
- B. Conformance to Standards.** The manufacturer of electrical control panels and their mounting and installation shall be done in strict accordance with the requirements of UL Standard 508A and the National Electrical Code (NEC), NFPA 70 latest revision so as to afford a measure of security as to the ability of the eventual owner to safely operate the equipment. No exceptions to the requirements of these codes and standards will be allowed; failure to meet these requirements will be cause to remove the equipment and correct the violation.
- C. U.L. Listing.** All service entrance, power distribution, control and starting equipment panels shall be constructed and installed in strict accordance with Underwriter's Laboratories (UL) Standard 508A "Industrial Control Equipment." The UL label shall also include an SE "Service Entrance" rating stating that the main distribution panel is suitable for use as service entrance equipment. The panels shall be shop inspected by UL, or constructed in a UL recognized facility. All panels shall bear a serialized UL label indicating acceptance under Standard 508A and under Enclosed Industrial Control Panel or Service Equipment Panel.

A photocopy of the UL labels for this specific project shall be transmitted to both the project Engineer and the Contractor for installation within their permanent project files, prior to shipment of the equipment covered under these specifications.
- D. E.T.L. Listing.** All control panels shall be E.T.L. Listed by Interek Testing Services (ITS) under the Industrial Control Panel (ICP) Category. Each completed control panel shall bear an ETL listing label stating that the panel conforms to UL STD 508A and is certified to CAN/CSA STD C22.2 NO. 14. The listing label shall include the station manufacturer's name, address and telephone

number. The station manufacturer shall have quarterly inspections performed by ETL at the manufacturer's facility to ensure that the products being listed comply with the report and procedural guide for that product.

- E. Grounding.** Each electrical equipment item in the station shall be properly grounded per Section 250 of the National Electrical Code. Items to be grounded include, but are not limited to, pump motor frames, control panel, transformer, convenience receptacles, dedicated receptacle for heater, air conditioner, dehumidifier, lights, light switch, exhaust fans and pressure switches.

All ground wires from installed equipment shall be in conduit and shall lead back to the control panel to a copper ground buss specific for grounding purposes and so labeled. The ground buss shall be complete with a lug large enough to accept the installing electrician's bare copper earth ground wire. The bus shall serve as a bond between the earth ground and the equipment ground wires.

- F. Panel Mounting Hardware.** Metal framing channel and hangers shall be used exclusively for mounting of electrical panels and electrical components except for those specifically designated otherwise. When mounting panels in buildings with 3/4" plywood interior sheathing, certain panels and components may be mounted by screwing these devices into the wall. The maximum weight of a panel mounted with four lag screws cannot exceed 250#. The lag screws must either be 5/16" or 3/8" diameter and be fully threaded.

- G. Electrical Distribution Panel.** The distribution panel shall be a single section, bolt-on panelboard, bottom feed, surface mount, SE rated, NEMA 1 enclosure for three phase, three wire, 480 VAC Delta power and with aluminum bus. Circuit Breakers are rated for 10 KAIC.

The main circuit breaker shall be rated for 200 amp service. The distribution panel shall be complete with the following branch circuit breakers:

1. One (1) 3-pole, 200 amp main breaker
2. Three (3) 3-pole, 80 amp pump motor breakers
3. One (1) 3-pole, 30 amp surge protection breaker
4. One (1) 3-pole, 15 amp phase monitor breaker
5. One (1) 2-pole, 40 amp primary transformer breaker

Nameplates will be provided in etched phenolic.

- H. Control Panel.** All circuit breakers, relays and controls shall be incorporated into one (1) NEMA 1 control panel.

There shall be provided, thermal-magnetic trip circuit breakers as follows:

1. One (1) Transformer Breaker, Secondary Side, 80 amps
2. Nine (9) Auxiliary Circuit Breakers:
  - a. Controls
  - b. Lights
  - c. Convenience Outlets
  - d. Air Conditioner
  - e. Dehumidifier

f. Four (4) Spare

**I. Media Converter.** Single Mode Fiber optic to Cat 6 Ethernet Media Converter. Unmanaged operation, DIN Rail mounted, RJ-45 Port Support Full/half Duplex operation, EDS Protection Diodes on RJ-45 port, Surge Protection Diodes on Power Inputs, in compliance with IEEE 802.3. The Media Converter shall be located in the control panel.

1. Approved manufacturer:
  - a. N-Tron 102MC, or approved equal.

**J. Fiber Optic Patch Panel.** Wall mounted Enclosure housing one CCH connector for single mode operation, 12F, (OS2).

1. Approved manufacturer:
  - a. Corning Single-Panel Housing (SPH) with Corning Connector CCH series, or approved equal.

**K. Electrical Apparatus – Variable Frequency Drives.** This specification is to cover a complete Variable Frequency motor Drive (VFD) consisting of a pulse width modulated (PWM) inverter designed for use on a standard NEMA Design B induction motor.

The VFD package as specified herein shall be UL listed as a complete assembly and enclosed in an integrated UL type 1 enclosure, assembled and tested by the manufacturer in an ISO9001 facility. The VFD tolerated voltage window shall allow the VFD to operate from a line of +30% nominal, and -35% nominal voltage as a minimum.

All VFDs shall have the same customer interface, including digital display, and keypad, regardless of horsepower rating. The keypad shall be removable, capable of remote mounting and allow for uploading and downloading of parameter settings as an aid for start-up of multiple VFDs. The keypad shall include Hand-Off Auto selections and manual speed control.

The drive shall incorporate bumpless transfer of speed reference when switching between Hand and Auto modes. There shall be fault reset and Help buttons on the keypad. The Help button shall include on-line assistance for programming and troubleshooting.

There shall be a built-in time clock in the VFD keypad. The clock shall have a battery backup with 10 years minimum life span. The clock shall be used to date and time stamp faults and record operating parameters at the time of fault. The clock shall also be programmable to control start/stop functions, constant speeds, PID parameter sets and output relays. The VFD shall have a digital input that allows an override to the time clock (when in the off mode) for a programmable time frame. There shall be four (4) separate, independent timer functions that have both weekday and weekend settings.

The VFDs shall utilize pre-programmed application macros specifically designed to facilitate start-up. The Application Macros shall provide on command to reprogram all parameters and customer interfaces for a particular application to reduce programming time. The VFD shall have two user macros to allow the end-user to create and save custom settings.

The VFD shall have cooling fans that are designed for easy replacement. Operating temperature will be monitored and used to cycle the fans on and off as required. The VFD shall be capable of starting into a coasting load (forward or reverse) up to full speed and accelerate or decelerate to setpoint without safety tripping or component damage (flying start).

The VFD shall have the ability to automatically restart after an over-current, over-voltage, under-voltage, or loss of input signal protective trip. The number of restart attempts, trial time, and time between attempts shall be programmable.

The overloading rating of the drive shall be 110% of its normal duty current rating for one (1) minute every ten (10) minutes, 130% overload for two (2) seconds. The minimum FLA rating shall meet or exceed the values in the NEC/UL table 430-150 for 4-pole motors.

The VFD shall have an integral 5% impedance line reactors to reduce the harmonics to the power line and to add protection from AC line transients. The 5% impedance may be from dual (positive and negative DC buss) reactors, or 5% AC line reactors. VFDs with only one DC reactor shall add AC line reactors.

The VFD shall include a coordinated AC transient protection system consisting of 4-120 joule rated MOVs (phase to phase and phase to ground), a capacitor clamp, and 5% impedance reactors. The VFD shall be capable of sensing a loss of load (broken belt/broken coupling) and signal the loss of load condition. Relay outputs shall include programmable time displays that will allow for drive acceleration from zero speed without signaling a false underload condition.

If the input reference (4-20mA or 2-10V) is lost, the VFD shall give the user the option of either (1) stopping and displaying a fault, (2) running at a programmable preset speed, (3) hold the VFD speed based on the last good reference received, or (4) cause a warning to be issued, as selected by the user.

The VFD shall have programmable Sleep and Wake up functions to allow the drive to be started and stopped from the level of process feedback signal.

All VFDs to have the following adjustments:

1. Three (3) programmable critical frequency lockout ranges to prevent the VFD from operating the load continuously at an unstable speed.
2. Two (2) PID Setpoint controllers shall be standard in the drive, allowing pressure or flow signals to be connected to the VFD, using the microprocessor in the VFD for the closed loop control.
3. Two (2) PID Setpoint controllers shall be standard in the drive, allowing pressure or flow signals to be connected to the VFD, using the microprocessor in the VFD for the closed loop control.
4. Two (2) programmable analog inputs shall accept current or voltage signals.
5. Two (2) programmable analog outputs (0-20mA or 4-20mA).
6. Six (6) programmable digital inputs for maximum flexibility in interfacing with external devices.
7. Three (3) programmable digital Form-C relay outputs.

8. Seven (7) programmable preset speeds.
9. Two (2) independently adjustable accel and decel ramps with 1 - 1800 seconds adjustable time ramps.
10. The VFD shall include a motor flux optimization circuit that will automatically reduce applied motor voltage to the motor to optimize energy consumption and audible motor noise.
11. The VFD shall include a carrier frequency control circuit that reduces the carrier frequency based on actual VFD temperature that allows the highest carrier frequency without derating the VFD or operating at high carrier frequency only at low speeds.
12. The VFD shall include password protection against parameter changes.

The Keypad shall include a backlit LCD display. The display shall be in complete English words for programming and fault diagnostics (alpha-numeric codes are not acceptable). All applicable operating values shall be capable of being displayed in engineering (user) units. A minimum of three operating values shall be capable of being displayed at all times.

The VFD shall have an RS-485 port as standard. The standard protocols shall be Modbus, Johnson Controls N2 bus, and Siemens Building Technologies FLN. Each individual drive shall have the protocol in the base VFD. All protocols shall be certified by the governing authority. Serial communications capabilities shall include, but not be limited to; run-stop control, speed set adjustments, current limit, accel/decel time adjustments, and lock and unlock the keypad. The drive shall have the capability of allowing the DDC to monitor feedback such as process variable feedback, output speed/frequency, current (in amps), percent torque, power (kW), kilowatt hours (resettable), operating hours (resettable), and drive temperature. The DDC shall also be capable of monitoring the VFD relay output status, digital input status, and all analog input and analog output valves.

All diagnostic warning and fault information shall be transmitted over the serial communications bus. Remote VFD fault reset shall be possible. The following additional status indicates and settings shall be transmitted over the serial communications buss - keypad Hand or Auto selected, bypass selected, the ability to change the PID setpoint. A minimum of 15 field parameters shall be capable of being monitored. The VFD shall allow the DDC to control the drive's digital and analog outputs via the serial interface. This control shall be independent of any VFD function.

All VFDs shall include EMI/RFI filters. The onboard filters shall allow the VFD assemble to be CE Marked and the VFD shall meet product standard EN 61800-3 for the First Environment restricted level.

All VFDs through 50 HP shall be protected from input and output power miss-wiring. The VFD shall sense this condition and display an alarm on the keypad.

1. Approved manufacturer:
  - a. ABB Model ACH550, or approved equal

**L. Electrical Power Transformer.** Balanced 115/230 single phase power for the auxiliary circuits within the scope of each booster station shall be obtained by use of a 15 KVA dry, step down transformer. The transformer shall be wall mounting type, in a NEMA 3R non-ventilated weatherproof enclosure. Transformer shall operate with noise levels equal to or less than ANSI and NEMA standards. Transformer insulation shall be Class 180c. The transformer shall meet the

most recent standards for efficiency. The unit shall be "UL" approved for indoor/outdoor application.

- M. Pump Motor Run Time Meter.** The control panel shall contain one running time meter supplied for each pump to show the cumulative number of hours of operation. The meter shall be enclosed in a dust and moisture proof molded plastic case, suitable for flush mounting on the main control panel. The meter dial shall register in hours and tenths of hours up to 99999.9 hours before repeating. The meter shall be suitable for operation from a 115 volt, 60 cycle supply.
- N. Electrical Phase Monitor.** A phase monitor shall be supplied to protect three-phase equipment against phase loss, under-voltage and phase reversal conditions. When a fault is sensed, the monitor output relay opens within two seconds or less to turn the equipment off and/or cause an audio or visual alarm. Both Delta and Wye systems may be monitored. The monitor shall have an automatic reset and shall also include an adjustable voltage delay.

The monitor shall have an indicator LED (glows when all conditions are normal and shall monitor phase sequence: ABC operate (will not operate CBA). The phase monitor shall be UL approved and CSA certified.

- O. Surge Protection Device.** A secondary surge arrester shall be provided. Housing shall be Noryl and be ultrasonically sealed. Valve blocks shall be metal oxide with an insulating ceramic collar. Gap design shall be annular. The lead wire shall be permanently crimped to the upper electrode forming part of the gap structure. Arresters shall be UL and CSA listed Lightning Protective Devices.
- P. Interior Electrical Conduit and Wiring.** All service entrance conduits power and signal, shall be rigid steel conduit, individually sized to accept the inbound service conductors and fiber optic cables.

These service entrance conduits shall be installed from the main power or control panel through the capsule steel sidewall or the building floor and terminate exterior to the equipment enclosure as a thread hub. The service entrance exterior conduit connection points shall be capped or plugged for shipment.

All wiring within the equipment enclosure and outside of the panel enclosures shall be run in conduit except where watertight flexible conduit is properly used to connect pump drivers, fan motors, solenoid valves, limit switches, etc., where flexible connections are best utilized.

Devices and appliances where furnished by the original manufacturer and being equipped with a UL approved rubber cord and plug, may be plugged into a receptacle. Equipment enclosure conduits shall be rigid, heavy wall, Schedule 40 PVC with solvent weld moisture proof connections, in minimum size 3/4" or larger, sized to handle the type, number and size of equipment conductors to be carried.

The conduiting shall be in compliance with Article 347 of the National Electrical Code and NEMA TC 2, Federal WC 1094A and UL 651 Underwriters Laboratory Specifications. Where flexible conduit connections are necessary, the conduit used shall be Liquid tight, flexible, totally



nonmetallic, corrosion resistant, nonconductive, U.L. listed conduit sized to handle the type, number and size of equipment conductors to be carried in compliance with Article 351 of the National Electrical Code.

Motor circuit conductors shall be sized for load. All branch circuit conductors supplying a single motor of one (1) horsepower or more shall have an ampacity of not less than 125 percent of the motor full load current rating, dual rated type THHN/THWN, as set forth in Article 310 and 430 B of the National Electrical Code, Schedule 310 13 for flame retardant, heat resistant thermoplastic, copper conductors in a nylon or equivalent outer covering.

Control and accessory wiring shall be sized for load, type MTW/AWM (Machine tool wire/appliance wiring material) as set forth in Article 310 and 670 of the National Electrical Code, Schedule 310 13 and NFPA Standard 79 for flame retardant, moisture, heat and oil resistant thermoplastic, copper conductors in compliance with NTMA and as listed by Underwriters Laboratories (AWM), except where accessories are furnished with a manufacturer supplied UL approved rubber cord and plug.

- Q. Gauge Pressure Transmitters.** Pressure transmitters shall be supplied to measure pump station suction and discharge pressure. The transmitters shall sense gauge pressure and transmit a 4-20 mA dc signal. The instruments shall measure pressure of a predetermined span. Range is to be fully adjustable throughout using allowable span and range limits. The accuracy shall be  $\pm 0.20\%$  of span. Each transmitter shall provide an analog output and include a standard LCD with pushbuttons to provide intelligent transmitter configuration directly from the on-board pushbuttons. The two-line digital indicator shall display the measurement in any selected units. The pushbuttons shall provide calibration of zero and span, setting of linear output, forward or reverse direction, external zero enable or disable, damping, failsafe action and local display including upper and lower range value selection.

All process-wetted parts of each instrument shall be Type 316L stainless steel. The transmitter shall be protected by a gasketed, weatherproof NEMA 4X enclosure. The transmitter shall be approved for use in hazardous locations (Nonincendive for Class 1 and Class II, Division 2 locations; intrinsically safe or explosion-proof for Class 1 and Class II, Division 1 locations).

The transmitter shall have 1/2 inch NPT female threaded tapping ports.

1. Approved manufacturer:
  - a. Foxboro Series IGP10, or approved equal

- R. Electrical Switches.** Multi-position switches including Hand-Off-Automatic switches shall be oil tight, 3-position maintained and be located on the main control panel door. Indicating lights shall be oil tight, with a full voltage pilot light. Nameplates shall be furnished on all panel front mounted switches and lights.

Switches, lights and pushbuttons shall be Schneider Electric, Series XB, 22 mm, Die Cast Chrome plated devices. Pilot lights shall be with protected LED's for 120 Vac operation as XB4BVG, pushbuttons shall be non-illuminated, momentary contact, extended lens as ZB4BL and the switches shall be 2 position maintained, 2 position right-to-left, 3 position maintained, 3 position

momentary-to-center, 3 position momentary from left to center, and 3 position momentary from right to center with standard black lever as ZB4BD.

1. Switches
  - a. Pump #1, 3-position
  - b. Pump #2, 3-position
  - c. Pump #3, 3-position
2. Lights
  - a. Red – Low Suction Pressure
  - b. Green – Pump #1 in Operation
  - c. Green – Pump #2 in Operation
  - d. Green – Pump #3 in Operation

The control panel door shall be complete on the interior with a stick-on transparency containing an "as-built" reproduction of the electrical control panel schematic. The wiring diagram shall be a corrected "as-built" copy & contain individual wire numbers, circuit breaker numbers, switch designation & control function explanations

**S. Station Exterior Lighting.** An exterior light shall be provided as located on the plans. The light shall be LED lighting source. Housing shall be one piece, injection molded, bronze polycarbonate. A button type photo control shall be provided.

**T. Station Interior Lighting.** There shall be one or more LED fixtures, enclosed and gasketed, forty eight (48) inch minimum light fixtures installed within the equipment enclosure, as shown on the plan for this item. The light switch shall be of the night glow type and be located conveniently adjacent to the door. Open fluorescent or incandescent fixtures will not be accepted.

**U. Dehumidifier.**

1. One (1) installed as shown.
2. Capacity 30 pints per 24 hours.
3. Compressor rated 115 volts, 60 Hz, 4.3 operating amps.
4. 106 CFM fan, 2 fan speed.
5. Humidity range 35 to 80% RH, ambient temperature range of 41 to 95 F, Type R410A refrigerant.
6. Washable filter.
7. Condensate piped direct to drain.
8. UL listed rubber cord.

**V. Heating/Cooling/Exhaust Unit.** The unit shall be one-piece, wall-mounted, factory-assembled, pre-charged, prewired, tested and ready-to-operate. The unit shall have a limited warranty of 5-years on parts and 1-year on compressor. Capacity and EER certified in accordance with ANSI/ARI Standard 390-2003.

1. One (1) each exterior wall mounted, hard-wired as shown
2. Enclosed weatherproof casing constructed of 20 gauge galvanized steel, finished with baked-on polyester enamel paint
3. One (1) washable filter
4. Remote adjustable thermostat

5. Refrigerant: 410A (HFC)
6. Minimum EER Rating: 9.00

Cooling Capacity	BTUH	Breaker size	CFM @ 0.2" ESP, (Max/Min)	Heater	Bard Manufacturing Part Number
1.5 Ton	16,400	30	825/600	5 KW	W18A1-A05BW

## 2.10 Exterior Electrical Service and Fiber Optic Connection.

### A. Electrical Connection.

1. General. The Contractor shall be required to make a complete electric service connection from the existing NYSEG electric pole as shown on the contract Drawings, and as specified herein. The electric service connection shall include:
  - a. Riser Pole Connection
  - b. Raceway System
  - c. Grounding of electrical components
  - d. Mounting a Meter and Meter socket per Utility requirements and the Drawings
  - e. All additional required work as shown on the plans, as specified by the station Manufacturer, and/or as ordered by the Engineer to fully complete the electric service connection.
2. Electrical Service. The electrical service provided for the booster pumping station shall be 480 volt, 3 phase, 60 Hertz, 4 wire.

**B. Fiber Optic Connection.** The Contractor shall install a buried conduit with fiber optic cable for the communication between the above-grade stations. The Contractor shall coordinate with the station manufacturer on conduit penetration locations and complete the installation of the conduit and cable, and make connections to the patch panel and media converter supplied by the manufacturer, as shown on the plans and/or as ordered by the Engineer.

**C. Raceway Systems.** As required by the NEC (minimum) with oversized raceways as indicated and where required for ease of pulling cable. Minimum conduit size: 3/4-inch, unless indicated otherwise.

1. Raceway Types. Rigid galvanized steel conduit, electrical metallic tubing (EMT), flexible steel conduit, liquid-tight flexible steel conduit and Schedule 40 heavywall and Schedule 80 extra-heavywall rigid non-metallic (PVC) conduit, conforming to applicable ANSI, NEMA and UL standards.
2. Fittings. All raceway fittings (except for rigid non-metallic conduit) to be steel or malleable iron, and UL-listed for the intended application. EMT fittings to be compression type.
3. Pull and Junction Boxes, and Wireways: Use as indicated and required. Junction and pull boxes for general indoor use (dry locations) to be of galvanized code gauge steel construction, minimum 4" square by 1-1/2" deep, with screw-on covers. Wireways to be UL listed, sheet steel construction with screw-on covers.
4. For exterior and damp or wet indoor locations, use boxes and wireways approved for such use.

5. Handholes: Light-weight and high-strength, constructed of fiberglass reinforced polymer concrete, gray color, suitable for use at temperatures down to -50°F, and resistant to sunlight, weathering, chemicals and freeze-thaw cycles, with bolt-on cover (with standard logo indicating type of service), and designed for in-grade use in areas with light vehicular traffic (5,000 lb. load over 10"x10" area). Acceptable Manufacturers: Quazite "Composolite," Styles "PC" or "PG", or approved equal.
6. Pipe Sleeves: Rigid steel conduit or iron pipe.
7. Conduit Seals: For Cast-in-Place Concrete Applications: Acceptable Manufacturers: O-Z/Gedney Type "FSK"; Thunderline Corp. "Link Seal" with "Link Seal Wall Sleeve", or approved equal. For Core Drilled and Pre-Cast Opening Applications: Acceptable Manufacturers: O-Z/Gedney Type "CSML"; Thunderline corp. "Link Seal", or approved equal.
8. Pull Wires: No. 14 AWG zinc-coated steel monofilament plastic line with 200 lb. tensile strength.

**D. 600 Volt Class Wire.** All wire and cable shall be constructed in accordance with all applicable ICEA, NEMA and IEEE published standards, and shall be UL-listed and labeled. Single-conductor, 98% conductivity, annealed, uncoated copper conductors with 600-volt rated type "THHN/THWN" insulation. Wire shall be annealed bare copper per ANSI/ASTM B3, UL 83, and Federal Specification JC-30A with 600 volt insulation, be stranded (except for #10 AWG and smaller may be solid), and be minimum size #12 AWG (Except for control wiring and signal circuits).

1. Insulation: Provide THHN/THWN insulation for all conductors, except XHHW insulation may be used for conductors #4 and larger.
2. Ampacity of conductors shall be rated for 75 degrees C regardless of temperature of conductor insulation when combining circuits in one conduit. Derate conductors and increase size per NEC when installing multiple circuits in a raceway, utilizing 75°C ampacity table.
3. Connectors: Nylon shell insulated metallic screw-on connectors for #14-10 AWG, and bolted pressure or compression type lugs and connectors with insulating covers for #8 AWG and larger.

**E. Hangers and Supports.** All hangers, supports, fasteners and hardware shall be zinc-coated or of equivalent corrosion resistance by treatment or inherent property, and shall be manufactured products designed for the application. Products for outdoor use shall be hot dip galvanized.

1. Types: Hangers, straps, riser supports, clamps, U-channel, threaded rods, etc. as indicated and/or required.
2. Seismic restraints and supports as indicated and/or required.

**F. Electrical Identification.**

1. Nameplates. Three-layer laminated plastic with minimum 3/16" high white engraved characters on black background, and punched for mechanical fastening. Fasteners: self-tapping stainless-steel screws or number 10-32 stainless steel machine screws with nuts and flat and lock washers. Each nameplate on all panelboards and switchgear shall indicate the following:
  - a. Panel Name
  - b. Voltage, Phase, Number of Wires

- c. Source
- 2. Underground Warning Tape: Six-inch wide polyethylene tape, permanently bright colored with continuous-printed legend indicating general type of underground line below and "CAUTION." Colors as follows:
  - a. Red – Electric
  - b. Orange - Communications
- 3. Marking Pens: Permanent, waterproof, quick drying black ink. Acceptable Manufacturers: Sanford Fine Point "Sharpie," or equal.
- 4. Wire Tags: Vinyl or vinyl-cloth self-adhesive wraparound type indicating appropriate circuit number, etc.
- 5. Arc Flash Panelboard Stickers: Provide per NEC 110.16.

**G. Grounding.** Ground rods, conductors, clamps and connectors, etc as required;

- 1. Ground Rods: Minimum 3/4" diameter by 10' long copper clad steel.
- 2. Welded Connectors: Exothermic process.

**H. Firestopping Materials.**

- 1. General: Firestop systems composed of firestop compounds and appropriate damming materials installed together with the penetrant (e.g., conduit) to form a complete firestop system, providing a fire resistant rating at least equal to the hourly fire resistance rating of the floor, wall or partition into which the firestop system is to be installed.
- 2. Test Standards: Firestopping materials shall be tested together as a system to the time/temperature requirements of ASTM E119 and shall be tested to UL 1479 (ASTM E814) and be UL classified for up to 3 hours.
- 3. Firestop Sealants: Non-hardening, conformable, intumescent putties, sealants or other compounds, containing no toxic solvents or asbestos, and exhibiting aggressive adhesion to all common building materials and penetrants, while allowing reasonable movement of the penetrants, without being displaced. Compounds shall be waterproof, non-toxic and smoke and gas tight.
- 4. Firestop Mortars: Light-weight, water-based, cementitious, fast drying, low density mortar, non-shrinking and non-cracking during its cure, and which forms a surface capable of being sanded, bored and painted.
- 5. Damming Materials: Mineral wool or ceramic fiber.
- 6. Multi-Cable Transits: Assemblies consisting of a frame, a compression mechanism, and grooved insert sealing modules sized for multiple penetrating elements of various sizes.
- 7. Acceptable Manufacturers: Hilti; Heavy Duty/Nelson; International Protective Coatings; Specified Technologies, Inc.

**I. Concrete Work**

- 1. Concrete shall be as follows;
  - a. Minimum Strength: 3000 psi @ 28 days
  - b. Aggregate: 3/4" aggregate
  - c. Cement: 588 #/cu. yd. minimum, type I or II
  - d. Slump: 4" maximum
  - e. Air: 5% - 7%
- 2. Reinforcing: Grade 60 bars, galvanized, sized as indicated, and 6" x 6" - W1.4 x W1.4 mesh, galvanized, and other reinforcing as indicated.

3. Forms: Wood, metal or other approved materials, constructed so as to withstand the forces of the newly placed concrete.
4. Equipment Pads: Minimum 4" thick indoor, 12" thick outdoor (with 9" below grade), with 1" x 45° chamfer on all top edges. For on grade installations provide 12" layer of crushed stone beneath pad. For pads to be placed on concrete floors, provide anchors into concrete floor. Comply with equipment manufacturer's specifications and/or utility company requirements.

## 2.11 Engine Generator

**A. General.** The station manufacturer will provide a generator and automatic transfer switch as shown on the contract documents of sufficient size to run the station background load and two (2) of the three (3) booster pumps. The generator set will be shipped separately and pad mounted at the jobsite. The Contractor is required to install the required fuel tank (provided by Town) and fuel lines to connect to the factory mounted engine-generator set.

1. Approved manufacturer:
  - a. Cummins-Onan Model 100GGHH, 100kW, 480/277V, 3PH, 4W or approved equal.

**B. AC Generator.** The AC generator shall be synchronous, four pole, revolving field, drip proof construction, single pre-lubricated sealed bearing, air cooled by a direct drive centrifugal blower fan, and directly connected to the engine with flexible drive disc(s). All insulation system components shall meet NEMA MG1 standard temperature limits for Class H insulation system. Actual temperature rise measured by resistance method at full load shall not exceed 150 degrees Centigrade.

A PMG excitation system shall use a separate power source from the main generator output. The automatic voltage regulator shall be temperature compensated, half wave phase controlled solid-state design and include an underspeed protection function. The regulator design shall include a torque-matching characteristic to allow the engine to use its fullest power producing capability at speeds lower than rated, to optimize motor starting capability and to provide the fastest possible recovery from transient speed dips.

The automatic voltage regulator shall be temperature compensated, solid-state design. The voltage regulator shall be equipped with three-phase RMS sensing. The regulator shall control buildup of AC generator voltage to provide a linear rise and limit overshoot. The regulator shall include an under frequency roll-off torque-matching characteristic, which shall reduce output voltage in proportion to frequency below a threshold of 58 Hz. The torque-matching characteristic shall include differential rate of frequency change compensation to use maximum available engine torque and provide optimal transient load response. Regulators which use a fixed volts per hertz characteristic are not acceptable. The broad range generator shall be capable of delivering rated output (KVA) at a rated frequency and power factor at any voltage with the broad range.

**C. Engine-Generator Control.** The control shall have automatic remote start capability from a panel-mounted 3-position (Stop, Run, Remote) switch. Provide cycle cranking of 15 SEC (ON)/15 SEC

(OFF) for three attempts (75 SEC). If engine fails to start, lockout the engine and indicate overcrank on alarm status panel.

The control shall shut down and lock out upon failing to start (over-crank), over-speed, low lubricating oil pressure, high engine temperature, or operation of a remote manual stop station. A panel mounted switch shall reset the engine monitor and test all the lamps. Lamp indications on the control panel shall include:

1. Over-crank shutdown – red
2. Over-speed shutdown – red
3. Low oil pressure shutdown – red
4. High engine temperature shutdown – red
5. High engine temperature pre-alarm – yellow
6. Low engine oil pressure pre-alarm – yellow
7. Low coolant temperature – yellow
8. Low fuel – yellow
9. Run – green
10. Not in automatic start - flashing red
11. Auxiliary (2) each - red (Customer identified).

The NEMA 1 enclosed control panel shall be mounted on the generator set with vibration isolators. A front panel illumination lamp with ON/OFF switch shall be provided. Control panel mounted indicating meters and devices shall include: Engine Oil Pressure Gauge, Coolant Temperature Gauge, DC Voltmeter, and Running Time Meter (hours).

#### **D. Engine.**

1. Fuel: Liquefied Petroleum Gas (Propane)
2. Rated Engine Speed: 1800RPM.
3. Lubrication System: The following items are mounted on engine or skid:
4. Lube Oil Pump: shall be positive displacement, mechanical, full pressure pump.
5. Filter and strainer: Provided by the engine manufacturer of record to provide adequate filtration for the prime mover to be used.
6. Crankcase drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.
7. Engine fuel system: The engine fuel system shall be installed in strict compliance to the engine manufacturer's instructions
8. Governor: Adjustable isochronous, with speed sensing.
9. Cooling system: Closed loop, liquid cooled. The generator set manufacturer shall provide prototype test data for the specific hardware proposed demonstrating that the machine will operate at rated standby load in an outdoor ambient condition of 40 deg C.
10. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer. Size of Radiator overflow tank: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
11. Expansion tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.

12. Temperature control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.

**E. Base.** The engine-generator set shall be mounted on a heavy duty steel base to maintain alignment between components. The base shall incorporate a battery tray with battery hold down clamps within the rails. Provisions for stub up of electrical conduits shall be within the footprint of the set. Vibration isolators, standard quantity and type of the manufacturer, shall be integral between generator set and base.

**F. Auxiliary Equipment and Accessories.**

1. Generator Main Circuit Breaker: Set-mounted and wired, UL listed, molded case thermal-magnetic type, rated at 200 amps, 3 pole, 480 volts. Field circuit breakers shall not be acceptable for generator over-current protection.
2. Coolant Heater: Engine mounted, thermostatically controlled, water jacket heater(s) for each engine. The heater(s) shall be sized as recommended by the equipment supplier. Heater voltage shall be as required
3. Starting and Control Batteries: Starting batteries, lead acid type, 12 or 24 volt DC, sized as battery cables and connectors.
4. Battery Charger: A 10 amp voltage regulated battery charger shall be provided for each engine-generator set. Input AC voltage and DC output voltage shall be as required. Chargers shall be equipped with float, taper and equalize charge settings. Operational monitors shall provide visual output along with individual form C contacts rated at 4 amps, 120 VAC, 30 VDC for remote indication of:
  - a. Loss of AC power - red light
  - b. Low battery voltage - red light
  - c. High battery voltage - red light
  - d. Power ON - green light (no relay contact)
5. Muffler. An exhaust muffler shall be provided for the engine, size and type as recommended by the generator set manufacturer. The mufflers shall be residential grade. Exhaust system shall be installed according to the generator set manufacturer's recommendations and applicable codes and standards.

**G. Housing.** Outdoor weather-protective Level 1 Quiet Enclosure housing shall be provided as factory-assembled to the generator set base and radiator cowling. Housing shall provide ample airflow for generator set operation. The housing shall have hinged side-access doors and rear control door. All doors shall be lockable. All sheet metal shall be primed for corrosion protection and finish painted with the manufacturer's standard color.

**H. Automatic Transfer Switch.** Complete factory assembled transfer equipment with electronic control designed for surge voltage isolation, voltage sensors on all phases of both sources, linear operator, permanently attached manual handles, positive mechanical and electrical interlocking and mechanically held contacts. Equipment rated a minimum 200 amps and less shall include quick-make, quick-break contact mechanisms for manual transfer under load. All transfer switches and accessories shall be UL listed and labeled, tested per UL Standard 1008 and CSA Approved.



1. Ratings. Main contacts shall be rated for 600 Volts AC minimum.
  - a. Transfer switches shall be rated to carry 100 percent of rated current continuously in the enclosure. Circuit breaker type transfer switches do not meet this specification.
  - b. Transfer switches shall be continuously rated in ambient temperatures of -40 to +50 degrees C, relative humidity up to 95% (non-condensing) and altitudes up to 10,000 feet.
  - c. Transfer switch equipment shall withstand a closing rating (WCR) in RMS symmetrical amperes greater than the available fault currents shown on the plans.
2. Construction. Transfer switches shall be double-throw, electrically and mechanically interlocked, and mechanically held in both positions.
  - a. Transfer switches rated through 1000 amperes shall be equipped with permanently attached manual operating handles and quick-break, quick-make over-center contact mechanisms suitable for safe manual operation under load. Transfer switches over 1000 amperes shall be equipped with manual operators for service use only under de-energized conditions.
  - b. Main switch contacts shall be high-pressure silver alloy. Contact assemblies shall have arc chutes for positive arc extinguishment. Arc chutes shall have insulating covers to prevent interphase flashover.
  - c. Provide one set Form C auxiliary contacts on both sides, operated by transfer switch position, rated 10 amps 250 VAC.
  - d. Enclosures shall be UL listed. The enclosure shall provide NEC wire bend space. The cabinet door shall be key-locking. Controls on cabinet door shall be key-operated. Provide switch position indicator lamps and power available lamps for both sources (four total) on the outside cabinet door.
  - e. Transfer switches shall be mounted in enclosures as designated on the contract documents. Separate enclosures shall be the NEMA type specified. The cabinet shall provide required wire bend space at point of entry as shown on the plans. Manual operating handles and all control switches (other than key-operated switches) shall be accessible to authorized personnel only by opening the key-locking cabinet door. Transfer switches with manual operating handles and/or non key-operated control switches located on outside of cabinet do not meet this specification and are not acceptable.
3. Automatic Controls. Control shall be solid-state and designed for a high level of immunity to power line surges and transients, demonstrated by test to IEEE Standard 587-1980. The control shall have optically isolated logic inputs, high isolation transformers for AC inputs and relays on all outputs.
  - a. Solid state undervoltage sensors shall simultaneously monitor all phases of both sources. Pick-up and drop-out settings shall be adjustable. Voltage sensors shall allow for adjustment to sense partial loss of voltage on any phase. Voltage sensors shall have field calibration of actual supply voltage to nominal system voltage.
  - b. Automatic controls shall signal the engine-generator set to start upon signal from normal source sensors. Solid-state time delay start, adjustable from 0 to 5 seconds (factory set at 2 seconds) shall avoid nuisance start-ups. Battery voltage starting

contacts shall be gold, dry type contacts factory wired to a field wiring terminal block.

- c. The switch shall transfer when the emergency source reaches the set point voltage and frequency. Provide a solid-state time delay on transfer, adjustable from 0 to 120 seconds.
  - d. The switch shall retransfer the load to the normal source after a time delay retransfer, adjustable from 0 to 30 minutes. Retransfer time delay shall be immediately bypassed if the emergency power source fails.
  - e. Controls shall signal the engine-generator set to stop after a time delay, adjustable from 0 to 10 minutes, beginning on return to the normal source.
  - f. Power for transfer operation shall be from the source to which the load is being transferred.
  - g. The control shall include latching diagnostic indicators to pinpoint the last successful step in the sequence of control functions, and to indicate the present status of the control functions in real time, as follows:
    1. Source 1 OK
    2. Start Gen Set
    3. Source 2 OK
    4. Transfer Timing
    5. Transfer Complete
    6. Retransfer Timing
    7. Retransfer Complete
    8. Timing for Stop
  - h. The control shall include provisions for remote transfer inhibit and area protection.
  - i. Transfer switches as designated on the plans shall be equipped with a field adjustable time delay during switching in both directions, during which time the load is isolated from both power sources, to allow load residual voltage to decay before closure to opposite source. The delay feature shall have an adjustable range of 0 to 7.5 seconds. Phase angle monitor is not acceptable. Transfer switches supplied without this delay shall have provisions to add it in the field without switch replacement.
4. Front Panel Devices. Provide devices mounted on cabinet front consisting of a key-operated selector switch to provide the following positions and functions:
- a. Test - Simulates normal power loss to control for testing of generator set. Controls shall provide for a test with or without load transfer.
  - b. Normal - Normal operating position.
  - c. Retransfer - Momentary position to override retransfer time delay and cause immediate return to normal source, if available.

Transfer switch position and source available lamps.

5. Accessory Items. Transfer switches as shown on the plans shall be equipped with accessories as follows:
- a. Exerciser Clock: Provide solid state exerciser clock to set the day, time, and duration of generator set exercise/test period. Provide with/without load selector switch for the exercise period.

- b. Battery Charger: Provide a float charge battery charger rated 2 amps. DC output voltage shall be as required for the starting batteries. An ammeter shall display charging current. The battery charger shall have fused AC input and DC outputs.
- 6. Approved manufacturer:
  - a. Onan Model OTECA-B225, or approved equal.

## 2.12 Control Strategy

### A General

- 1 The Contractor shall provide all labor, materials, equipment, and incidentals required to furnish and install a supervisory control and data acquisition (SCADA) system, complete and operational with programmable logic controllers (PLCs), and networking cable and devices, control panel enclosures, software, programming, interconnecting cables, and all necessary accessories as shown on the Contract Drawings, as specified herein, or as required for complete operation.
- 2 All components of the SCADA System have been included under this Section so that the Owner will receive a completely coordinated and properly integrated system for efficiency, ease in operation, and correct functional relationship among all elements of the system. Therefore, all equipment specified under this Section shall be furnished by a single SCADA system supplier. This does not require that all equipment be manufactured by a single manufacturer, but does require that the SCADA system supplier be responsible for the satisfactory operation of the instrumentation and metering equipment and the SCADA system furnished hereunder. This does in no way relieve the Contractor for ultimate responsibility under this Contract for equipment, coordination, installation, operation, and guarantee.
- 3 It is the intent of this Contract that the installations be complete in all respects and ready for use and operation. The Contractor shall be responsible for all details, devices, accessories and special construction necessary to properly furnish, install, adjust, test and place in successful continuous operation, complete installations of this type.
- 4 The Contract Drawings are for purpose of guidance and to show functional features and required external connections. They do not necessarily show all components necessary to accomplish the desired results nor do they necessarily shown all components required to interface with the equipment. The Contractor shall provide all parts, equipment, wiring, control panels, and devices necessary to meet the functional requirements of the system.
- 5 The Contractor shall provide I/O wiring diagrams. Control loop drawings shall be incorporated in the I/O drawings. These drawings are to illustrate terminal block numbers of control panels, wire numbers, wire colors, and field terminations (terminal numbers) of all field devices including instruments and drives. These drawings shall be furnished in a timely fashion as required by the electrical contractor for conduit routing and wire pulling, labeling and terminations by the electrical contractor.
- 6 Contractor shall provide and install stainless steel tags engraved with instrument/devices labels I/O tags fastened to the field devices for the ease of identification in the field.

- 7 The Contract Drawings are intended to show the general arrangement of equipment including, but not limited to, instruments, piping, valves, pumps, drains, control panels, and supports. They are not intended to show exact dimensions. Connection piping may have to be modified in order to accommodate the actual equipment furnished. The cost of such modifications is considered as being in the bid price and, therefore, no payment will be made for such modifications.
- 8 Performance requirements: The SCADA system supplier shall furnish a SCADA system providing all necessary control functions for totally integrated operation from the booster pump station to the distribution system, including but not limited to the booster pump control panel, rechlorination station, and associated ancillary items. The SCADA system shall execute the following functions:
  - a. Communicate analog level signal from the rechlorination station to the booster pump station.
  - b. Monitor and control operations via the PLCs.
  - c. Automatically record information pertaining to these operations.
  - d. Communicate between hardware components and field instrumentation.
  - e. Display all monitored values and alarms at the PLCs.
  - f. Display all monitored values, alarms, displays, trends, etc. on the PLCs.
  - g. Allow operators to input control set points via the PLCs.
  - h. Provide a UPS, ninety minutes worth of uninterruptible power supply to the PLCs. The stations will be on an emergency backup generator. In the event of a power failure, the system shall resume full control and functionality automatically when power is restored. This includes programming VFD's such that faults are cleared.

**B Control Strategy.** The following control strategy describing the operations of each control loop indicated on the Drawings will be considered the essence of the specifications. Furnish and install all necessary equipment, instruments, software modules and appurtenances to achieve the performance as hereinafter described, even though such items may not be included in any specific listing of equipment to be furnished. An involved system of this nature requires emphasis on the functional aspects of the Specifications while the technical details serve to indicate the desired manner in which the end result will be accomplished. The following control strategies are associated with the facilities indicated below:

1. Booster Pumps (Booster Pump Station)
  - a. Field. The booster pumps shall be operated automatically based on the distribution system pressure measured in the hydropneumatic/rechlorination station. Each Pump will be controlled with a variable frequency drive (VFD). Each VFD shall be equipped with a Human Interface Module (HIM). The HIM shall be capable of an auto/manual mode and display the frequency of the well pump motor and other programming parameters. The VFD shall be networked to the SCADA PLC via a ControlNet communication port. A safety disconnect at the location of the booster pumps is to be equipped with an auxiliary contact that is hardwired to the VFD enable terminal (if the disconnect is opened, the drive is disabled).
  - b. SCADA. The Booster Pump PLC shall designate a Lead Pump, Lag No. 1, and standby for each 24-hour period on a rotating basis. The system shall activate the booster pumps based on the following set points (adjustable):

- (1) Pump On: 165 psi (pressure within hydropneumatic/rechlorination station)
  - (2) Pump Off: 200 psi (pressure within hydropneumatic/rechlorination station)
- \*The VFDs shall ramp the pumps up and down between these set points.

The Booster Pump PLC shall be capable of monitoring and displaying the status operation of each VFD and booster pump including the speed of each pump. If the lead pump fails, the Lag Pump No. 1 shall be activated. The booster pump PLC shall initiate an alarm and annunciate the appropriate condition upon pump failure. The Booster Pump Station PLC shall also display and record the run time for each pump.

2. Booster Pump Station Pressure Transmitters

- a. Field. Two (2) pressure transmitters, installed on the suction and discharge side of the pump system within the Booster Pump Station shall continuously monitor pressure. The transmitter shall convert the pressure to a 4 – 20 mA signal, shall locally display the pressure in psi, and shall send a signal to the Booster Pump Station PLC (set points indicated above).
- b. SCADA. The Booster Pump Station PLC shall accept the 4 – 20 mA signal, and display and record the instantaneous pressure in psi. In the event of a low pressure event on the suction side of the pumps the transmitter shall be interlocked with the pump operation and automatically shut down operation of the pumps. The minimum suction pressure set point shall be adjustable and be field set initially at 5 psi.

3. Booster Pump Station Water Flow

- a. Field. A flow meter, installed on the 3-inch inlet line in the Booster Pump Station shall continuously monitor the water flow from the Clinton Correctional Facility water system. The transmitter shall convert the raw water flow to a 4 – 20 mA signal, shall locally display the instantaneous flow rate in gpm and the total daily flow in gallons, and shall send a signal to the Booster Pump Station PLC.
- b. SCADA. The Booster Pump Station PLC shall accept the 4 – 20 mA signal, and display and record the instantaneous water flow rate in gpm and the total daily water flow in gallons.

4. Hydropneumatic/Rechlorination Station Pressure Transmitter

- a. Field. A pressure transmitter, installed on the upstream side of the pressure reducing valve within the hydropneumatic/chlorination station shall continuously monitor the pressure entering the station. The transmitter shall convert the pressure to a 4 – 20 mA signal, shall locally display the pressure in psi, and shall send a signal to the Hydropneumatic/Rechlorination PLC (set points indicated above).
- b. SCADA. The Hydropneumatic/Rechlorination PLC shall accept the 4 – 20 mA signal, and display and record the instantaneous pressure in psi. The hydropneumatic/rechlorination station pressure shall be utilized by the Booster Pump PLC to modulate the speed of the booster pump VFDs.

5. Hydropneumatic/Rechlorination Station Water Flow

- a. Field. A flow meter, installed on the inlet line in the Hydropneumatic/Rechlorination Station shall continuously monitor the water flow from the booster pump station. The transmitter shall convert the raw water flow to a 4 – 20 mA signal, shall locally display the

instantaneous flow rate in gpm and the total daily flow in gallons, and shall send a signal to the Hydropneumatic/Rechlorination Station PLC.

- b. SCADA. The Hydropneumatic/Rechlorination Station PLC shall accept the 4 – 20 mA signal, and display and record the instantaneous water flow rate in gpm and the total daily water flow in gallons. The flow rate shall be utilized by the Hydropneumatic/Rechlorination Station PLC to modulate the chemical feed pumps.
6. Sodium Hypochlorite (NaOCl) Feed Pump
  - a. Field. The NaOCl feed pump shall deliver sodium hypochlorite to the finished water prior to discharge to the distribution system. They shall be operated automatically based on the water chlorine residual reading and the water flow rate to maintain a dosage of 2 mg/L (adjustable) entering the distribution system. Each sodium hypochlorite feed pump shall be equipped with a local microprocessor controller with keypad and operation indication. The controller shall accept a 4 – 20 mA analog speed reference signal and provide a 4 – 20 mA analog speed feedback signal for closed loop operation. The controller shall provide a dry relay contact for alarming low fluid level from a two-stage flow switch installed in the Day Tank.
  - b. SCADA. The Hydropneumatic/Rechlorination Station PLC shall provide a Start/Stop signal, a 4 – 20 mA speed reference signal and accept a 4 – 20 mA speed feedback signal. The hydropneumatic/rechlorination PLC shall indicate pump operation status and speed for each feed pump. Hydropneumatic/Rechlorination Station PLC shall initiate an alarm upon feed pump failure.
7. Sodium Hypochlorite (NaOCl) Day Tank Level
  - a. Field. A two-stage float switch shall be installed to continuously monitor the sodium hypochlorite day tank level. The float switch shall be connected directly to the sodium hypochlorite feed pump controllers. The sodium hypochlorite feed pump controllers shall have an alarm contact for low level annunciation to the Hydropneumatic/Rechlorination Station PLC.
  - b. SCADA. The Hydropneumatic/Rechlorination Station PLC shall receive the 24VDC discrete alarm signal from sodium hypochlorite feed pumps and shall initiate a warning signal for a low tank level of 1.6 inches (adjustable) above the finished floor of the Chemical Feed Room and a pump shutdown signal for a tank level of 0.86 inches above the finished floor.
8. Water Chlorine Residual
  - a. Field. A chlorine residual analyzer, located in the Hydropneumatic/Rechlorination Station shall continuously monitor the water chlorine residual. The transmitter shall convert the water chlorine residual to a 4 – 20 mA signal, shall locally display the finished water chlorine residual in mg/L, and shall send a signal to the Hydropneumatic/Rechlorination PLC.
  - b. SCADA. The Hydropneumatic/Rechlorination Station PLC shall accept the 4 – 20 mA signal, and display and record the instantaneous water chlorine residual in mg/l of free chlorine. The water chlorine residual shall be utilized by the Hydropneumatic/Rechlorination Station PLC to modulate the chemical feed pumps. The Hydropneumatic/Rechlorination Station PLC shall initiate an alarm upon a high water chlorine residual of 2.0 mg/L (adjustable) or a low water chlorine residual of 0.2 mg/L

(adjustable).

9. Booster Pump and Hydropneumatic/Rechlorination Station Generators

- a. Field. An automatic transfer switch shall be installed at each of the stations to accommodate the utility loads. Utility power failure, transfer switch connected to utility, transfer switch connected to generator, generator failure, and generator run status shall be inputs to each of the PLCs.
- b. SCADA. The PLCs shall accept and display each of the above-described status and alarm conditions. When the PLCs receive indication of a utility power failure, it shall wait until generator run status and transfer switch connected to generator status is received, then after a 15 second time delay (adjustable) shall restore the run status that preceded the utility power failure.

**C Warranty**

- 1 Equipment furnished under this Section shall be guaranteed to be free of defects in workmanship, design, and material. The Contractor shall replace, without cost to Owner, any equipment or part that is defective or shows undue wear, within one (1) year after the equipment has been placed into continuous, permanent operation.
- 2 The Contractor shall include the services of a factory-trained representative to provide repair service for the equipment under this Section for a period of one (1) year from date that the equipment is placed into continuous, permanent operation. The cost of all replacement parts required during this one (1) year period shall be included.
- 3 The Contractor shall pay all royalty or license fees for use of patented devices or systems and shall protect the Owner from patent infringement litigation thereon

**D Spare Parts**

- 1 Contractor shall furnish the following spare parts and equipment and store as directed:
  - a One of each type of plug-in, process I/O board for PLC.
  - b Two (2) 16 gig jump drives

**E Source Quality Control**

- 1 Prior to shipment of the SCADA system, factory test all elements of the system, both hardware and software, to demonstrate that the total system satisfies all of the requirements of this Section.
- 2 Furnish all special testing materials and equipment. Where it is not practical to test with real process variables, provide suitable means of simulation. These simulation techniques shall be subject to the approval of the Engineer.
- 3 Testing shall not be considered complete until all tests and test documentation has been completed, reviewed, and approved by the Engineer. Tests shall generally conform to the applicable sections of ISA-RP55.1. Demonstrate that all equipment conforms to these Specifications by submitting test results for similar units.
- 4 Coordinate all of the testing with all other associated suppliers and with the Owner, as specified. Notify the Engineer at least four weeks prior to start of testing.

- 5 As a minimum, test the system at the factory with simulated inputs and outputs. Exercise all components and test all functions over their entire range. During the test, operate the system long enough to demonstrate that it is capable of continuous operation.
- 6 Submit a PDF copy of the results of the factory tests to the Engineer.
- 7 In the event that the conditions specified are not met or if the test is deemed unsatisfactory for other reasons, correct the fault and retest the entire system until the tests are satisfactory to the Owner all at no additional cost to the Owner.
- 8 The Owner may elect to have up to three of his authorized representatives present to witness the tests. The Owner's authorized representatives will have access to all parts of the equipment, apparatus, and test instruments and will have the right to check any or all readings, calibrations, or any factor necessary to determine whether or not the performances are in accordance with the Specifications.
- 9 The Owner reserves the right to waive the presence of any or all of his representatives at any or all witness tests. This right of waiver does not release the manufacturer from performing the required test

### 2.13 Controls

- B. General.** Provide one (1) complete Programmable Logic Controller (P.L.C.) based control system as described herein. The system shall employ industry standard Programmable Logic Controllers as described herein. The system shall be completely factory integrated and tested in the factory and field run-in with factory personnel.
- C. Design.** This equipment specification and related documents represent a design based on the Allen-Bradley 1400 Series Programmable Logic Controllers. Communications, interface, input/output and other peripheral devices have been proven to be 100% compatible with the Allen-Bradley equipment. No other PLC equipment is acceptable unless the Engineer-of-Record provides notification of alternate system approval by addendum prior to the bid date
- D. System Responsibility.** The station manufacturer shall be the System Integrator and as such will assume full and complete responsibility for the Station P.L.C. Control System and related control functions and the telemetric communication for the full scope of supply.

This assumption of full responsibility shall include identifying all electrical, mechanical and plumbing schematics and wiring inter-connect diagrams, providing instrument installation details, preparing input/output listings, writing software, performing software and hardware integration, installation in the station at the factory, debugging, calibrating and tuning the various components and subsystems and providing training and warranty services.

- E. U.L. Listing.** The system integrator shall produce panels that fully comply with Underwriters Laboratory Standard for Industrial Control Panels #508A. All panels shall be UL 508A listed. The UL 508A "sticker" shall be clearly displayed in the appropriate location within the panel. The UL 508A listing shall be in the name of the equipment manufacturer.



- F. System Integrator.** The station manufacturer shall have on staff no fewer than four (4) full time Control System Engineers who are dedicated to the development of P.L.C. programs, SCADA software, Instrumentation configuration and control logic development. The system integrator shall have no fewer than three (3) electrical engineers on staff dedicated to the development of panel wiring diagrams, panel layouts and general electrical design.

The system Integrator shall have a field service department with no less than five (5) fully equipped, trained and competent field service technicians able to work on any and all devices provided with this system. The system integrator shall have been in the business of providing telemetry, control and SCADA systems to the water production and water distribution market for no less than 10 years.

The System Integrator shall submit a list of all personnel with title, job function, years with the company, years in this field and educational achievements with the submittal. Companies that do not meet the above requirements will not be approved.

- G. Design, Assembly and Test.** The PLC panel design, assembly, the integration of component parts and startup will be the responsibility of the manufacturer of record for the factory-built water distribution equipment. That manufacturer shall maintain at its regular place of business a complete PLC design, assembly and test facility to assure continuity of control design with equipment application.

- H. Enclosures.** Enclosures shall be NEMA 1 for indoor and NEMA 4 for outdoor locations. Enclosure shall be fabricated from a minimum of 14-gauge cold rolled steel with a baked enamel finish in the manufacturer's standard color. Units shall include a single gasket front door. Hinges, locking hasp and door clamping hardware shall be included.

- I. Power Requirements and UPS.** Controls shall operate from a source of 120 volts, 1 phase, 60 Hz. Each panel shall be accompanied with an uninterruptible power supply (UPS). The UPS shall condition the power as well as provide 500 VA of power during outages. A 6-amp control power circuit breaker shall be employed as both a method of equipment protection and as a means of power disconnection. The circuit breaker shall be a single pole, thermal, magnetic type with a 10,000 Amp Interrupt Current rating. The circuit breaker shall be UL listed.

- J. Power Supplies.** All DC power supplies required for operation shall be provided. Units shall provide sufficient voltage regulation and ripple control to assure powered components can operate within their required tolerances.

- K. Transient Voltage Surge Suppression (TVSS).** The system manufacturer shall provide transient voltage and surge suppression for all PLC data communication devices whenever the communications cable is located outside the building in which the panel resides. This also applies to all outdoor panels with communications cables exiting the PLC panel enclosure. The TVSS unit shall be UL 497B listed. The TVSS unit shall have a maximum DC operating voltage of 9.6 VDC, a clamping voltage of 81V, and an 8 x 20 US surge current rating of 1000 amps. The unit shall be approved for use by Allen-Bradley Company on the Allen-Bradley Data Highway communications products.

Transient voltage and surge suppression shall also be provided for 10-32 VDC instrumentation signal systems. The TVSS units shall be employed when the signal cable extends beyond the boundaries of the building in which the PLC panel is located. The TVSS unit shall be UL 497B listed. The TVSS unit shall have a maximum operating voltage of 32 VDC, a clamping voltage of 100V, and an 8 x 20 US surge current capability of 1000 amps.

TVSS units must be as manufactured by Leviton, Inc., of Little Neck, New York, Model 3803-485/DHP for PLC communications and Model 3420-009/035 for 10-32 VDC signal wiring, without exception.

- L. Wiring Requirements.** All wiring shall be in complete conformance with the National Electrical Code, state, local and NEMA electrical standards. All incoming and outgoing wires shall be connected to numbered terminal blocks and all wiring neatly tied and fastened to chassis as required.
- M. Network Data Line Surge Suppressors.** Provide transient surge suppressors for Ethernet connections that are included as a part of this system. Unit shall have connection capabilities for RJ45, 100 BASE-T, 10 BASE-T, Token Ring, and RS-422 connections. The unit shall have a nominal clamping voltage of 7.5 volts and a Peak Pulse Current rating of 750 amperes. Unit shall be as manufactured by Tripp Lite, Inc., Model DNET-1.
- N. Programmable Logic Controller (PLC).** Provide microprocessor-based Programmable Logic Controllers (PLC) as detailed in this specification and on the applicable plan sheets. The PLC shall be capable of use in a stand-alone configuration and also be capable of being networked into a larger system. It shall be specifically suitable for use in a telemetry system as an intelligent remote telemetry unit. The PLC shall be programmable in standard ladder logic.

The PLC shall have a processor and thirty-two (32) embedded discrete I/O. The I/O shall be expandable with the use of expansion I/O. The expansion I/O shall not require a "rack" in which to be mounted.

The program shall be stored on non-volatile Electrically Erasable Programmable Read Only Memory (EEPROM) modules. The CPU shall have 10,000 bytes (10K) user memory and perform 32 bit signed math functions. The CPU shall have integral to it, two communications ports capable of RS-232 DF-1 half, and full duplex serial communications as well as MODBUS RTU Slave protocol, and DF- 1 radio modem. The CPU also shall have a third port integral to it a communications port capable Ethernet communications. The CPU shall have on-line programming feature without interrupting the program running at the time.

1. The PLC shall be powered from 85/265 VAC 60 Hz line power.
2. The PLC shall be U.L. listed, C-U.L. listed, CE compliant and suitable for use in Class 1, Division 2, Groups A, B, C and D environments.
3. The PLC shall be equipped with the following embedded discrete I/O:
  - a. 20 - 120 VAC inputs
  - b. 12 - relay outputs.

4. The CPU shall have a LCD display integral to the unit for display of status and selectable information.
5. The PLC shall have expansion I/O capabilities as follows: Discrete input modules shall be available in 8 channel configurations. The modules shall accept 20-48 VDC, 100-240 VAC signals. Modules shall have a removable terminal strip.
6. Relay Output Modules: Relay output modules shall be available in 8 channel versions. Modules shall be rated for 5-265 VAC and 5-125 VDC voltages.
7. Analog Input / Output Module: Analog input modules shall be available in 4 channel configurations, 2 inputs and 2 outputs. The modules shall be rated for input signals between 4 mA and 20 mA., or 0 – 10 VDC. The module shall employ a 12 bit analog to digital conversion chip. Outputs shall be either 0-10 VDC or 0-20 mA DC. The output digital to analog converter shall have 12 bit resolution. .

**O. Operator Interface Equipment.** The PLC control system shall include a 7” High-Definition front panel mounted touch screen display for operator interface. The display shall have a 6.1" X 3.4” screen with 800 x 480 pixel resolution using 65K-color TFT LCD. The screen shall have no touch cells and utilize analog resistive technology. Unit shall have 64mb of operating RAM, 128mb flash, and a high-speed 400MHz processor. Unit shall have a real time clock chip as a standard option. Operator interface shall have integrated Ethernet port and shall support the Allen-Bradley Ethernet/IP protocol.

The color touch screen operator interface shall be manufactured by Maple Systems Inc., Everett, WA 98204, Model #HMI5070th, Silver Series. All required communication modules, cables, and accessories shall be provided for a complete and operational system.

**P. Programming Software.** All PLC equipment supplied on this project shall be programmable in standard ladder logic. The ladder logic development and configuration software shall be the same for all PLC's listed in this specification. Equipment requiring separate program development and configuration software for each product is not acceptable.

The software program shall be Windows based and be Microsoft certified for use with Windows 7. The software shall be able to develop the ladder logic programs, provide equipment configurations, diagnostics for both equipment and software, upload programs, download programs, and edit programs "on-line" where applicable.

1. Approved manufacturer:
  - a. Rockwell Software, a division of Rockwell Automation, Model RS-LOGIX, or approved equal.

**Q. Ethernet Switch.** Ethernet switch to have 5 TP RJ45 ports minimum. Switch shall be an unmanaged switch with auto negotiation, in compliance with IEEE 802.3, store and forward switching mode.

1. Approved manufacturer:
  - a. Phoenix Contact p/n 2891152, or approved equal.

**B. Fiber Optic Patch Panel.** Wall mounted Enclosure housing one CCH connector for single mode operation, 12F, (OS2).

1. Approved manufacturer:
  - a. Corning Single-Panel Housing (SPH) with Corning Connector CCH series, or approved equal.

**R. Media Converter.** Single Mode Fiber optic to Cat 6 Ethernet Media Converter. Unmanaged operation, DIN Rail mounted, RJ-45 Port Support Full/half Duplex operation, EDS Protection Diodes on RJ-45 port, Surge Protection Diodes on Power Inputs, in compliance with IEEE 802.3.

1. Approved manufacturer:
  - a. N-Tron 102MC, or approved equal.

**S. Operator Description for PLC and VFD Controlled System.** There shall be control algorithms programmed into the Programmable Logic Controller to operate the system based on an operator adjustable discharge pressure output setpoint through local setting.

The system shall control pump starting and stopping, the cascading of pumps and pump speed through the variable frequency drives based upon station pressure with safety cutouts based upon suction pressure and discharge pressure and pump speed. The PLC shall be programmed by personnel who are an employee of the station manufacture to insure a single source of responsibility and maintenance.

The PLC-VFD system shall operate automatically to adjust the output of the selected pump in order to maintain an adjustable discharge pressure setpoint for the operation of the station. Pump output shall be adjusted by varying the speed at which it operates. The speed shall be controlled by a variable frequency drive (VFD) and the calculation of needed pump speed shall be performed by a programmable logic controller (PLC) which shall have input to it a signal directly proportional to the discharge pressure of the station.

The PLC shall employ a standard Proportional Integral and Derivative algorithm to calculate the 4-20mA speed reference output to the drives needed to maintain the station setpoint. Initially, the VFD's shall provide ramping speed control on start and stop.

The pumps shall be brought on and offline in a cascading sequence as controlled by the pump selection/alternation portion of the control algorithm. Pump speed, with two or more pumps online, shall be the same for all pumps. When a pump comes online, its speed shall increase from the minimum speed while the online pump(s) speed shall be decreased, all to a speed which meets demand. Pumps going offline shall be done in the opposite manner to avoid pressure surges in the system.

Pump speeds shall be set at the minimum allowed for the proper motor cooling. These minimum speeds shall be set into the VFD program parameters. Manual speed control can be accomplished through the use of a speed adjustment feature on the VFD unit. Each unit shall have a Hand-Off-Automatic switch, speed adjustment and status.

**T. Major Equipment at Booster Pump Station.**

1. Allen-Bradley MicroLogix 1400 PLC, or approved equal
2. NEMA enclosure

3. Pressure transmitters (2)
4. Complete configuration & programming
5. Operator Interface Unit
6. Other devices as needed to provide a complete and operable installation.

**2.14 Foundation.** The foundation and concrete pad, including splash, door, and propane tank pads, shall be designed and furnished by the Contractor. The design shall be submitted for review as part of the station submittal package.

1. Submittals shall be stamped by a licensed Professional Engineer, registered in the state of New York.
2. Buoyancy calculations shall be included as part of this submittal.
3. The Contractor shall design conventional shallow foundations, bear a minimum of 5' below finished grade, based on a minimum soil bearing pressure of 3,000lbs/ft<sup>2</sup> in accordance with the March 2016, CHA Geotechnical Engineering Report. Additional geotechnical subsurface investigations may be performed at the Contractor's expense, which may yield a higher soil bearing capacity. If performed, a copy of the Geotechnical Evaluation shall be submitted along with the foundation design.
4. The Contractor shall provide the necessary connection system for installation of the packaged booster pumping station to the foundation, based on recommendations from the station manufacturer.
5. The design of the concrete foundation, the specifications for the cement and aggregate, and the mixing of the aggregate shall be in accordance with the latest version of Standard 318 of the American Concrete Institute (ACI). The concrete shall develop a minimum compression strength of 4,000 psi at 28 days.

**2.15 Spare Parts.** Provide one set of spare lights, fuses, and breakers.

### **3 CONSTRUCTION**

**3.01 General.** Equipment installation shall be in complete conformance to manufacturer's instructions.

**3.02 Shipment and Delivery.** The station manufacturer will be required to deliver the station complete and undamaged by the manufacturer's carrier to the site fully assembled and ready for the power, fiber optic communication, with inlet, outlet, and drain piping connections to be completed on site.

The station manufacturer shall provide the spreader bars, and any on site station rigging, from the spreader bars to the station base required for off-loading, and placement of the station in the final position on the Contractor installed concrete foundation at the site.

**3.03 Equipment Protection.** Protect all equipment, and materials and work from the weather elements, paint, mortar, construction debris and damage, until project is substantially complete. Repair, replace, clean all electrical work so affected.

**3.04 Site Preparation and Execution.** Excavation of the booster pumping station shall be in accordance with Section 206 *Trench, Culvert, and Structure Excavation*. Compaction of each layer shall be in

accordance with §203-3.03C. *Compaction*. Backfill material at structures shall be in accordance with §203-1.01H *Suitable Material*.

**3.05 Access.** The Contractor must provide a level unobstructed area large enough for crane and tractor-trailer to park adjacent to the station foundation. Crane must be able to place outriggers within 5'-0" of edge of foundation and truck and crane must be able to get side by side under their own power.

**3.06 Pipeline Connections.** Install as specified by the station manufacturer and as shown on the Drawings.

**3.07 Floor Drains.** Floor drains shall drain to daylight using a slope of 1/4" per foot and be fitted with a stainless steel screen at the pipe discharge as shown on the Drawings.

### **3.08 Electrical Service and Fiber Optic Connection**

**A. General.** The installation of all electrical work and fiber optic connections shall be in accordance with the intent of the Contract Documents, as determined by the Engineer.

All materials and equipment shall be installed as recommended by the respective manufacturers, by mechanics experienced and skilled in their particular trade, in a neat and workmanlike manner, in accordance with the standards of the trade, and so as not to void any warranty or UL listing.

All electrical work shall be performed under the Contractor's direct supervision, using sufficient and qualified personnel as necessary to complete the work in accordance with the progress schedule. The Contractor shall assign one or more competent supervisors who shall have authority to accept and execute orders and instructions, and who shall cooperate with the other Contractors and subcontractors, the Engineer and Owner in all matters to resolve conflicts and avoid delays.

**B. Fiber Optic Cable.** The fiber optic cable shall be furnished under a separate item. The work required to install the cable from the riser pole into the station for service connection shall be included under this item.

**C. Conditions Verification.** Examine the areas and conditions under which the work is to be performed, and identify any conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

**D. Coordination.** Sequence, coordinate and integrate the installation of all electrical materials and equipment for efficient flow of work, in conjunction with the other trades. Review the Drawings for work of the other trades, and report and resolve any discovered discrepancies, prior to commencing work.

1. Cooperation. Cooperate with the other Contractors and individual disciplines for placement, anchorage and accomplishment of the work. Resolve interferences between work of other disciplines or Contractors, prior to commencing installation.
2. Chases, Slots, and Openings. Arrange for chases, slots, and openings during the progress of construction, as required to allow for installation of the electrical work.
3. Supports and Sleeves. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.

4. Obstacles and Interference. When installing equipment and raceways, provide offsets, fittings, accessories and changes in elevation or location as necessary to avoid obstacles and interferences, per actual field conditions.
5. Space Requirements. Electrical equipment sizes indicated on drawings are generally based on specified manufacturer. Verify that the proposed equipment will fit in the space indicated on the drawings. Maintain clearances required by NEC.

#### **E. Dimensions.**

1. Building Dimensions. For exact locations of building elements, refer to dimensioned drawings. However, field measurements take precedence over dimensioned drawings.
2. Site Dimensions. Field measurements take precedence over scaled electrical site plans.
3. Establish the exact location of electrical equipment based on the actual field verified dimensions of equipment furnished.

#### **F. Electrical Installation.**

1. Unfinished and Finished Areas. For the purposes of these electrical specifications, “unfinished” areas shall include mechanical and electrical equipment rooms. All other areas shall be considered “finished” spaces, unless indicated or approved otherwise.
2. In Unfinished Areas: Raceways, equipment and devices may be installed concealed or exposed, unless indicated otherwise.
3. In Finished Areas: Conceal all raceway and flush mount all electrical boxes, equipment, and devices unless indicated or approved otherwise. The space above suspended ceilings or behind furred spaces is considered outside finished areas and electrical materials installed within these areas are considered concealed.
4. Minimum Mounting Height. Install exposed raceway and all other electrical equipment (e.g., lighting fixtures) with not less than 7'-6" clear to finished floor, unless indicated or approved otherwise, and excluding raceway and equipment mounted on walls.
5. Dimensions and Clearances. Field measure all dimensions and clearances affecting the installation of electrical work, in relation to established datum, building openings and clearances, and work of other trades, as construction progresses.
6. Rough-In Locations. Verify final locations for rough-ins with field measurements and requirements of actual equipment being installed.
7. Door Swings. Verify the swings of all doors before switch outlets or other electrical devices are installed. If necessary, relocate devices so they are not obstructed by doors when doors are open.
8. Ceiling Mounted Devices. The locations indicated on the architectural reflected ceiling plans take precedence over the electrical documents, in the event of conflict.
9. Install equipment, conduit, cable tray, hangers, and supports to withstand seismic forces for the seismic zone of the installation.

#### **G. Layout**

1. General. Install electrical systems, materials and equipment level and plumb, and parallel and perpendicular to other building systems and components, where installed exposed.
2. Serviceability. Install electrical equipment and raceways, etc. to readily facilitate servicing, maintenance and repair or replacement of components, and so as to minimize interference with other equipment and installations.

3. Clearances. Prior to commencing work, verify that all electrical equipment will adequately fit and conform to the indicated and code required clearances, in the spaces indicated on the Drawings. If rearrangement is required, submit plan and elevation drawings or sketches indicating proposed rearrangement, for the Engineer's approval. Do not rearrange without express written permission of the Engineer.

#### **H. Holes, Sleeves, and Openings.**

1. General. Provide all holes, sleeves, and openings required for the completion of the work and restore all surfaces damaged, to match surrounding surfaces. Maintain integrity of all fire and smoke rated barriers using approved firestopping systems. When cutting holes or openings, or installing sleeves, do not cut, damage or disturb structural elements or reinforcing steel, unless approved, in writing, by the Engineer.
2. Conduit Penetrations. Size core drilled holes so that an annular space of not less than 1/4" and not more than 1" is left around the conduit. When openings are cut in lieu of core drilled, provide sleeve in rough opening. Size sleeves to provide an annular space of not less than 1/4" and not more than 1" around the conduit. Patch around sleeve to match surrounding surfaces.

#### **I. Firestopping Systems.**

1. General. Install firestopping at all electrical raceway and cable penetrations through floor structures and interior walls or partitions which are time-rated fire and/or smoke barriers.
2. Preparation. Prior to installation, verify that all penetrating elements and supporting devices are permanently installed and that surfaces which will be in contact with penetration seal materials are clean and free of dust, dirt, grease, oil, loose materials, rust or other substances.
3. Installation. Install firestop systems in accordance with UL approved design details and the manufacturer's instructions. Install sleeves, conduits and cables with required clearance spaces, allowing installation of sealing materials. Do not exceed the outside diameter of the sleeve, conduit or cable by more than one inch or by less than 1/4" when making openings for penetrations. Install firestop systems so as to completely seal openings to prevent passage of smoke and water.

#### **J. Underground Work.**

1. General. Perform all excavating, trenching and backfilling, etc. as indicated or required for the installation of all underground electrical work. Coordinate work with other trades and verify existing underground services and conditions.
2. Conduit Burial Depth. 30" below finished grade. All excavation and burial depths indicated are below finished grade.
3. Excavating. Do not excavate below required depth, except as necessary for removal of unstable soil or when rock is encountered. When rock is encountered, excavate six inches below the required depth and backfill with a minimum 6" layer of crushed stone or gravel between rock bearing surface and the electrical installation. Stockpile satisfactory excavated materials where directed, until required for backfilling. Remove and legally dispose of excess excavated materials and materials not suitable for backfill use. Shore and brace as required for stability of excavation. Remove shoring and bracing when no longer required. Where sheeting is allowed to remain, cut top of sheeting off at an elevation of 30" below finished grade.



4. Protection. Protect structures, utilities, sidewalks, pavements and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by excavations.
5. Existing Utilities. Remove existing electrical and other utility lines so indicated. Where existing utilities which are to remain exist within areas of excavation, locate such utilities and support and protect during excavation operations.
6. Trenching. Cut all trenches neatly and uniformly and so as to provide ample working room and at least six inches clearance on both sides of raceways, etc., unless otherwise noted. Take necessary precautions when working near existing underground utilities, and coordinate with the installation of concurrent utilities by other trades. Unless indicated otherwise, pitch all electrical conduit runs downward away from buildings, manholes, and pad mounted equipment. Excavate trenches to depth indicated or required. Limit length of open trench to that in which installations can be made and trenches backfilled within the same day.
7. Sand Envelope. Install a minimum envelope of three inches (top, bottom, and sides: three inches each) of fine grain sand around all electrical cables and conduits installed below grade unless indicated otherwise.
8. Preparation for Backfilling. Backfill excavations as promptly as work permits, but not until completion of inspection, testing, approvals, and recording of underground utility locations. Prior to backfilling, remove all concrete form work, shoring, bracing, trash and debris.
9. Backfilling. Use only approved materials free from boulders, sharp objects and other unsuitable materials. Match the final elevations and materials of areas affected by electrical excavating, trenching and backfilling. Replace conduit and cables damaged by improper backfilling. Replace surface materials to match existing surface materials if no other utility or site work is being done in area. Place specified soil materials in 4" - 8" layers to required subgrade elevations, for area classifications as follows:
  - a. Under Building Slabs: Use drainage fill materials.
  - b. Under Piping and Equipment: Use subbase materials where required over rock bearing surfaces and for correction of unauthorized excavation.
  - c. For Raceways Less below Surface of Paved Areas, Driveways, or Roadways: Provide 4" thick concrete base slab support. After raceway installation, provide 4" thick concrete encasement (sides and top) prior to backfilling and placement of roadway subbase. Refer to contract Drawings for Details.
10. Backfill Placement. Place backfill and fill materials in layers of not more than 8" in loose depth for material compacted by heavy equipment, and not more than 4" in loose depth for material compacted by hand-operated tampers. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification specified below. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice. Place backfill and fill materials evenly adjacent to structures, piping, and equipment to required elevations. Prevent displacement of raceways and equipment by carrying material uniformly around them to approximately same elevation in each lift.
11. Compaction. Compaction shall be in accordance with the Section 203-3.03C *Compaction*.
12. Detectable Warning Tap. Install detectable warning tape 18" below grade.

#### **K. Raceway Systems.**

1. Raceway Types. Unless indicated otherwise, use raceway types as follows:
  - a. Indoors, Concealed in Walls or Above Ceilings: EMT.

- b. Indoors, Exposed: Use rigid galvanized steel conduit below ten feet above finished floor. EMT may be used above ten feet.
  - c. Indoors, Below Floor Slab: (Minimum 3/4 inch size). Schedule 80 rigid non-metallic conduit. Stub up using rigid galvanized steel elbows.
  - d. Outdoors, Below Grade: (Minimum 1-inch size). Schedule 80 rigid non-metallic conduit. Stub up using rigid galvanized steel elbows. Schedule 40 rigid non-metallic conduit.
  - e. Outdoors, Exposed: Rigid galvanized steel conduit.
  - f. Flexible Steel Conduit: Use (in dry locations only) for connections to transformers, vibrating equipment, and equipment requiring minor adjustments in positions, for final connections to recessed lighting fixtures, and between outlet boxes in metal stud partitions.
  - g. Liquid-Tight Flexible Steel Conduit: Use where flexible steel conduit connections are required in damp, wet or oily locations, and for final connections to all motors and similar equipment.
2. Raceway Routing. As required by job conditions unless specific routes or dimensioned positions are indicated on the drawings. Install tight to slabs, beams and joists wherever possible. Route exposed conduit, and conduit installed above ceilings, parallel or perpendicular to walls ceilings and structural members. Install to maintain minimum headroom and to present a neat appearance. Run parallel raceways together with bends made from same center line. Verify exact locations of all raceways, pull boxes, and junction boxes. Resolve any conflicts before installation.
  3. Raceway Installation. Cut conduit ends square using saw or pipecutter and ream each cut end smooth. Carefully make all conduit bends and offsets so that the inside diameter of pipe is not reduced. Make bends so that legs are in the same plane. Make offsets so that legs are in the same plane and parallel. Protect stub-ups from damage, and carefully rebend when necessary.
  4. Fittings. Make up all raceway fittings tight so that final installation of raceway, fittings and enclosures constitutes a firm mechanical assembly and a continuous electrical conductor. Where required, provide bonding jumpers to assure electrical continuity.
  5. Protection. Protect all raceways, enclosures and equipment during construction to prevent entry of concrete, debris and other foreign matter. Free clogged conduits of all obstructions, or replace, prior to pulling wire. Do not pull wire within buildings until buildings are completely enclosed.
  6. Boxes. Install all outlet, pull and junction boxes rigidly, plumb and level. Support and secure boxes independently from conduits terminating at box. Install all boxes so as to be accessible and so that covers may be easily removed.
  7. Handholes. Provide as indicated, installed plumb and level. Where not indicated, install every 200' at a minimum.
  8. Conduit Seals. Install conduit seal for each conduit penetrating an exterior building wall below grade (unless penetration is below lowest building floor slab), and elsewhere as indicated, and so as to achieve a sealed watertight installation.
  9. Pull Strings. Provide pull strings in all spare conduits.

#### **L. Concrete Work.**

1. General. All concrete shall be prepared from approved materials and poured on clean, stable surfaces.

2. Exterior Base Surfaces. Twelve-inch layer of crushed stone over well consolidated, stable, undisturbed soil. Where the underlying soil contains excess organic material, trash or voids, or fails to provide solid bearing for any other reason, excavate to the depth required for solid bearing and re-establish the required elevation with approved granular materials.
3. Finishing. Trowel all exposed surfaces smooth. Round-off or chamfer all exposed edges.
4. Curing. Beginning immediately after placement, protect concrete from premature drying, excessive hot or cold temperatures and mechanical injury. Maintain minimal moisture loss at relatively constant temperature throughout period necessary for hydration of cement and hardening of concrete.

#### **M. Conductors – 600 Volt and Below**

1. Minimum Conductor Size. All branch circuit wiring shall be minimum #12 AWG. All control circuit wiring shall be minimum #14 AWG, unless indicated otherwise. Provide larger sizes as indicated or required.
2. Branch Circuit Conductor Sizes. Provide branch circuit conductor sizes as indicated on the panelboard schedules, plans, or elsewhere. Neutral conductor size to match phase conductors unless indicated otherwise. Provide branch circuit switch legs and travelers as required for the switching indicated.
3. Equipment Grounding Conductor Required. For each branch circuit and feeder run, provide an equipment grounding conductor for continuous length of run, sized per NEC 250-122 (minimum), larger if so indicated.
4. Feeders. Provide feeder conductor sizes and quantities as indicated.
5. In Raceway. Install all wiring in conduit or other specified raceway, unless indicated otherwise.
6. Terminations. Furnish and install terminations, including lugs if necessary, to make all electrical connections indicated or required. Make connections and terminations for all stranded AWG conductors using crimp, clamp, or box type connectors and terminators. Enclose all strands of stranded conductors in connectors, and lugs.
7. Color. Conductors #10 and smaller shall be factory color-coded by integral pigmentation with a separate color for each phase and neutral. #8 and larger shall have stripes, bands, hash marks or color pressure-sensitive plastic tape. Color code all branch circuit and feeder conductors as follows:
  - a. 208/120 Volts:

Phase	Color
A	Black
B	Red
C	Blue
Neutral	White

- b. Equipment Grounding Conductors: Green
8. Phase Arrangement. Arrange phases in all electrical equipment as follows:
  - a. A, B, C: Front to Rear
  - b. A, B, C: Top to Bottom.
  - c. A, B, C: Left to Right When Facing Established Front of Equipment.

**N. Equipment Connections.**

1. Connect complete, all equipment requiring electrical connections, furnished as part of this Contract or by others, unless indicated otherwise.
2. Equipment Variations. Note that equipment sizes and capacities as shown on the Contract Documents are for bidding purposes and as such may not be the exact unit actually furnished. Contractor shall anticipate minor variations in equipment and shall include in his Bid all costs required to properly connect the equipment actually furnished.
3. Verification. Obtain and review shop drawings, product data and manufacturer's instructions for equipment furnished by others. Examine actual equipment to verify proper connection locations and requirements.
4. Coordination. Sequence electrical rough-in and final connections to coordinate with installation and start-up schedule and work by other trades.
5. Rough-In. Provide all required conduit, boxes, fittings, wire, connectors and miscellaneous accessories, etc., as necessary to rough in and make final connections to all equipment requiring electrical connections. In general, motors and equipment shall be wired in conduit to a junction box (or safety switch) near the unit, and from there to the unit in flexible metal or liquid-tight flexible steel conduit.
6. Connections. Provide properly sized overload and short circuit protection for all equipment connected, whether furnished under this Contract or by others. Verify proper connections with manufacturer's published diagrams and comply with same. Verify that equipment is ready for electrical connections, wiring and energization, prior to performing same.
7. Control Wiring. Provide all control wiring to remote devices or equipment as indicated or required. Modify equipment control wiring, install or disconnect jumpers, etc., as required.

**O. Hangers and Supports.**

1. General. Rigidly support and secure all electrical materials, raceway and equipment to building structure using hangers, supports and fasteners, suitable for the use, materials and loads encountered. Provide all necessary hardware.
2. Overhead Mounting. Attach overhead mounted equipment to structural framework or supporting metal framework. Do not make attachments to steel roofing, steel flooring or ceiling mineral tile.
3. Wall Mounting. Support wall mounted equipment by masonry, concrete block, metal framing or sub-framing.
4. Exterior Walls. Mount all electrical equipment located on the interior of exterior building walls, at least one inch away from wall surface, using suitable spacers.
5. Structural Members. Do not cut, drill or weld any structural member.
6. Independent Support. Do not support electrical materials or equipment from other equipment, piping, ductwork or supports for same.
7. Temporary Conditions. Do not attach to or support electrical work from removable or knockout panels or temporary walls or partitions.
8. Raceway Supports. Rigidly support all raceway with maximum spacings per NEC, and so as to prevent distortion of alignment during pulling operation. Use approved hangers, clamps and straps for individual runs. Do not use perforated straps or tie wires. Where multiple parallel raceways are run together, use trapeze type hanger arrangement made from U-channel and accessories, suspended by threaded rods, and allow at least 25% spare capacity for future installation of additional raceways. Rigidly anchor vertical conduits serving floor-mounted or

“island” type equipment mounted away from walls with metal bracket or rigid steel conduit extension secured to floor.

9. Miscellaneous Supports. Provide any additional structural support steel brackets, angles, fasteners and hardware as required to adequately support all electrical materials and equipment.
10. Seismic Restraints and Supports. Provide as indicated and/or as required per seismic zone indicated.

**P. Electrical Identification.**

1. General. Locate nameplate, marking, or other identification means on outside of equipment or box front covers when above ceilings and when in mechanical or electrical equipment rooms or other unfinished areas, and on inside of front cover when in finished rooms/areas. Use Contract Document designations for identification unless indicated otherwise.
2. Nameplates. Provide nameplate engraved with equipment designation for each safety switch, panelboard, transformer, motor starter, and all other electrical cabinets, etc.
3. Underground Warning Tape. During trench backfilling for each underground electrical, signal and communications line, provide a continuous underground warning tape located directly above line, at six to eight inches below finished grade.
4. Marking Pen Labeling. Mark each junction and pull box indicating source designation and circuit number(s) for the enclosed conductors.
5. Wire Tags. For power circuits, apply wire tag indicating appropriate circuit or feeder number to each conductor present in distribution panel and panelboard gutters, and to each conductor in pull and junction boxes where more than one feeder or multi-wire branch circuit is present. Where only a single feeder or multi-wire branch circuit is present, box cover labeling and conductor color coding is sufficient. For control, communications and signal circuits, apply wire tag indicating circuit or termination number at all terminations and at all intermediate locations and boxes where more than one circuit is present.
6. Panelboard Circuit Directories. At completion of project, accurately complete each panelboard circuit directory card, identifying load served or “spare” or “space” for each circuit pole. When modifying, adding or deleting circuits at an existing panelboard, update the existing (or provide new) circuit directory card to accurately reflect final conditions.

**Q. Grounding.**

1. General. Provide all system and equipment grounding as indicated and as required by the NEC.
2. Equipment Grounding. Provide a green equipment grounding conductor, sized per NEC 250-122 (larger if so indicated) with each feeder and branch circuit run.
3. Provide exothermic welded connections where indicated.

**3.09 Cutting and Patching.**

- A. General.** Provide all cutting, drilling, chasing, fitting and patching necessary for accomplishing the work. This includes any and all work necessary to: uncover work to provide for the installation of ill-timed work; remove and replace defective work and work not conforming to the requirements of the Contract Documents; install equipment and materials in existing structures; in addition to that required during the normal course of construction.
- B. Building Structure.** Do not endanger the integrity of the building structure by cutting, drilling or otherwise modifying any structural member, without specific approval. Do not proceed with any structural modifications without written permission of the Project Structural Engineer.

**C. Repairs.** Repair any and all damage to work of other trades caused by cutting and patching operations, using skilled mechanics of the trades involved.

**3.10 Welding.** Where welding is required, such welding shall be performed in a skilled manner by certified welders. Verify that welds are free from cracks, craters, undercuts, and strikes, weld spatter, and any other surface defects. Clean and re-weld any welds deemed unacceptable in size or configuration. Do not weld to structural steel without prior written permission from the Engineer.

**3.11 Foundation.** Following the setting of the station, the Contractor shall be required to anchor the station to the foundation. The Contractor shall supply and install the required anchor bolts per the approved design documents. All materials and equipment shall be installed as recommended by the respective manufacturers, by mechanics experienced and skilled in their particular trade, in a neat and workmanlike manner, in accordance with the standards of the trade, and so as not to void any warranty or UL listing.

**3.12 Factory Start-Up Service.** Start-up and warranty service shall be performed by the station manufacturer. A total of two (2) days for startup services and on-site operator training shall be provided by a qualified factory-trained operator who is a regular employee of the station manufacturer to perform the following:

- A. Check and approve the installation before it is placed into service and make final adjustments as necessary.
- B. Supervise the equipment start-up and initial operation.
- C. Operate the system in the presence of the Engineer and demonstrate the proper operation of all equipment.
- D. Instruct Owner personnel on the care and maintenance of the equipment.
- E. Prepare a written report summarizing the start-up and initial operation activities.
- F. Revisit the project site as often as necessary until all problems are resolved and the installation and operation are entirely satisfactory in the judgement of the Owner.

**3.13 Testing.** After the station plumbing is completed, the pressure piping within the station, including valves, control valves, fittings, and connections that make up the entire system shall be hydrostatically tested at a pressure of 300 psi. The test pressure shall be applied for a minimum of 20 minutes, during which time all joints, connections and seams shall be checked for leaking. Any deficiencies found shall be repaired and the system shall be retested.

The results of this testing shall be transmitted in writing to the Engineer prior to shipment of the station and shall note test pressure, time at full pressure and be signed by the Quality Control Manager or test technician.

**3.14 Disinfection.** Disinfection shall performed in accordance with Section 663 *Water Supply Utilities*.

**3.15 Field Quality Control.** Field testing shall be performed after installation of the equipment. The field testing shall demonstrate the following:

- 1. The equipment has been properly installed in accordance with manufacturer's instructions and recommendations.

2. The equipment has been installed in the specified location and orientation or as shown on the Contract Drawings.
3. The equipment operates without overheating or overloading of any parts, and without objectionable vibration.
4. There are no mechanical defects in any of the parts.

#### 4 **METHOD OF MEASUREMENT**

The work will be measured on a lump sum bases for the installation of a factory built, above grade packed booster pump station. The work shall include all labor, materials, equipment, and incidentals as specified in this special note and as shown on the Drawings. The bid price shall include the cost of excavation for the station foundation and all necessary subgrade materials as recommended by the manufacturer.

#### 5 **BASIS OF PAYMENT**

Payment will be made at the contract price to furnish all materials, labor and equipment necessary to satisfactorily complete the work as specified, except where specific costs are designated or included in another pay Item of work as shown on the contract plans and as specified herein:

- A. Clearing and Grubbing.** Clearing and Grubbing will be paid for under Item 201.07 "Clearing and Grubbing"
- B. Site Work.** Site work will be paid for under Item 203.02 "Unclassified Excavation and Disposal".
- C. Electrical Service.** Utility electrical work performed at the station will be paid for under Item 662.60000108 "Furnish Electrical Service".
- D. Fiber Optic Cable.** Fiber optic cable shall be furnished under Item 683.9221121 "Fiber Optic Cable – 12 Fibers". The cost to install the cable from the riser pole into this station shall be paid for under Item 663.10010107.

**Payment will be made under:**

<b>Item No.</b>	<b>Item</b>	<b>Pay Unit</b>
663.10010107	Packaged Booster Pump Station	Lump Sum

**SPECIAL NOTE****ITEM 663.10020107 - PACKAGED HYDROPNEUMATIC / RE-CHLORINATION STATION****1 DESCRIPTION****1.01 General.**

- A. Under this item, the Contractor shall provide all labor, materials, equipment, and incidentals required to install a factory built, above-grade packaged hydropneumatic/re-chlorination station, in accordance with these specifications and the contract plans, complete and ready to operate.
- B. The station shall include, but not be limited to, all the necessary internal piping, control valves, flow meters, instrumentation, and appurtenances installed in a fabricated steel base and enclosed in a modular structure as shown on the contract Drawings and as specified herein. The station shall be complete when delivered to the site and will not require internal Contractor construction except where indicated on the contract Drawings.
- C. Under this item, the work shall include, but is not limited to:
  - 1. Excavation for the station foundation and all necessary subgrade materials;
  - 2. Design and installation of the foundation, splash and propane tank pads;
  - 3. Installation of packaged station as per the manufacturers requirements;
  - 4. Floor drain piping and pipeline connections;
  - 5. Pipe bollards;
  - 6. Coordination with the Town and MX Fuels for propane fuel tank delivery setup, and initial fill-up of the tank;
  - 7. Initial fill-up of the chemical storage drum;
  - 8. Completion of all electrical, telephone, and fiber optic service connections and raceway systems including conduit and wire, except that furnishing fiber optic cable shall be paid for under a separate item;
  - 9. Work as indicated on the contract plans and/or as specified herein.
- D. The Drawings are for the purpose of guidance and to show functional features and required external connections. They do not necessarily show all components necessary to accomplish the desired results nor do they necessarily show all components required to interface with the equipment. Exact equipment locations and raceway routing, etc. shall be governed by actual field conditions and/or instructions of the Engineer. The Contractor shall provide all parts, equipment, wiring, piping, and devices necessary to meet the functional requirements of the system.
- E. The Drawings are intended to show the general arrangement of the equipment including, but not limited to, pumps, motors, piping, fittings, valves, supports, wet well, and meter pit. They are not intended to show exact dimensions. Connection piping may have to be modified in order to accommodate the actual equipment furnished. The costs of such modifications are considered as being in the bid price and, therefore, no payment will be made for such modifications.
- F. Equipment and appurtenances vary by manufacturer. If modifications to the Drawings are required to change equipment configuration, piping, equipment supports or, appurtenances, the Contractor shall submit drawings stamped by a Professional Engineer who is licensed in the state



of New York to the Engineer for approval. All related design and construction costs associated with any modifications will be the responsibility of the Contractor.

### 1.02 Codes and Regulations

- A. General: Comply with the latest recognized edition of the National Electrical Code (NEC) and all governing federal, state, and local laws, ordinances, codes, rules, and regulations. Where the Contract Documents exceed these requirements, the Contract Documents shall govern. In no case shall work be installed contrary to or below minimum legal standards.
- B. Utilities: Comply with all applicable rules, restrictions, and requirements of the utility companies serving the project site/facilities.
- C. Non-Compliance: Should any work be performed which is found not to comply with any of the above codes and regulations, provide all work and pay all costs necessary to correct the deficiencies.
- D. Arc Flash Program & Electrical Contractor shall have an OSHA compliance Arc Flash Safety Program.

### 1.03 References

- A. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified:
  - 1. American Water Works Association (AWWA).
  - 2. New York State Department of Health (NYSDOH).
  - 3. American National Standards Institute (ANSI).
  - 4. American Society for Testing and Materials (ASTM).
  - 5. National Electrical Code (NEC).
  - 6. National Electrical Manufacturer's Association (NEMA).
  - 7. National Electric Safety Code (NESC).
  - 8. Electric Testing Laboratory (ETL).
  - 9. Building Code of New York State (BCNYS).
  - 10. Insulated Cable Engineers Association (ICEA).
  - 11. Institute of Electrical and Electronic Engineers (IEEE).
  - 12. National Sanitation Foundation (NSF).
  - 13. Institute of Electrical and Electronic Engineers (IEEE).
  - 14. Steel Structures Painting Council (SSPC).
  - 15. Underwriter's Laboratory, Inc. (UL).

### 1.04 Submittals

- A. Submit the following shop drawings for approval:
  - 1. Manufacturer's information, specifications, and data showing dimensions, materials of construction, and weight of all major items of equipment. Mark each submittal to clearly indicate proposed product, options, finishes, etc.
  - 2. Installation diagrams showing location, arrangement, and size of all anchor bolts required for the equipment.
  - 3. Equipment, piping, and valve layout and schematic drawings.

4. Electrical Shop Drawings: Submit for all custom equipment and systems (e.g., panelboards) to be used on the project. Shop Drawings to be newly prepared, specifically for this project, and shall include all information listed in the Shop Drawings submittal requirements in the respective specification section. Include all pertinent information such as equipment/system identification, manufacturer, dimensions, nameplate data, sizes, capacities, types, materials, performance data, features, accessories, wiring diagrams, etc, in sufficient detail so as to clearly indicate compliance with all specified requirements and standards. For control systems, provide computer generated control ladder diagrams specifically developed for this project (standard diagrams not acceptable).
  5. Statement of compliance with ANSI/AWWA specifications.
- B. For information: Submit an Operation and Maintenance Manual as follows:
1. The station manufacturer and controls integrator shall provide an Operation and Maintenance Manual containing as built final system drawings, I/O listings, wiring diagrams, and operating and maintenance information.
  2. The submitted manuals shall be sufficient to facilitate the operation, removal, installation, programming, configuration, adjustment, calibration, testing and maintenance of each and all components and instruments.
- C. For information: Submit the station design stamped by a licensed Professional Engineer, registered in the state of New York. This submittal shall include structural calculations for the station structural components.
- D. For information: Submit a foundation design stamped by a licensed Professional Engineer, registered in the state of New York. This submittal shall include structural calculations for the concrete foundation, as well as door and splash pads.

### 1.05 Quality Assurance

- A. The Owner shall receive a completely coordinated and properly integrated hydropneumatic/re-chlorination station for efficiency, ease in operation, and correct functional relationship among all elements of the system.
- B. Qualifications:
1. All equipment provided under this Special Note shall be a standard product in regular production by manufacturers having a minimum of 5 years and 20 installations of proven and reliable experience in providing the equipment and services intended for this project. Supplier shall provide a list of names and dates, if requested, of installations for verification by the Engineer.
  2. A factory-authorized maintenance and parts facility shall be located within a 500-mile radius from equipment installation. The manufacturers shall show evidence of a parts inventory for all routine maintenance items associated with the supplied equipment.
- C. Installer's Qualifications: Firm with not less than five years' experience in the installation of electrical systems and equipment similar in scope and complexity to those required for this Project, and having successfully completed at least ten comparable scale projects.

- D. Certifications: Certify that the equipment installation is in accordance with manufacturer's instructions and recommendations.
- E. Incidental Work: Excavation, backfill, painting, patching, welding, carpentry, mechanical work, concrete pads and the like related to or required for work shall be performed by craftsman skilled in the appropriate trade, but shall be provided for under this item

#### **1.06 Inspections**

- A. General: During and upon completion of the work, arrange and pay all associated costs for inspections of all electrical work installed under this contract. The cost associated with electrical inspections, reports, shall be included in this item.
- B. Inspections Required: As per the laws and regulations of the local and/or state agencies having jurisdiction at the project site.
- C. Inspection Agency: Provide electrical inspection and report performed by third party inspection agency acceptable to the Authority and local utility provider. The report shall certify that the installation is in accordance with the contract documents and applicable codes.
- D. Certificates: Submit all required inspection certificates.
- E. Coordination: Coordinate inspections with the local utility.

#### **1.07 Delivery, Storage and Handling**

- A. Packing and Shipping: Deliver products in original, unopened packaging, properly identified with manufacturer's identification, and compliance labels.
- B. Storage and Protection: Comply with all manufacturer's written recommendations. Store all products in a manner which shall protect them from damage, weather, and entry of debris.
- C. Damaged Products: Do not install damaged products. Arrange for prompt replacement

#### **1.08 Warranty**

- A. The equipment furnished under this Item shall be guaranteed to be free of defects in workmanship, design, and material. The Contractor shall replace, without cost to the Owner, any equipment or part that is defective or shows undue wear, within one (1) year after the equipment has been placed into continuous, permanent operation.
- B. The Contractor shall include the services of a factory-trained representative to provide repair service for the equipment under this Item for a period of one (1) year from date that the equipment is placed into continuous, permanent operation. The cost of all replacement parts required during this one (1) year period shall be included.

- C. The building shall be warranted by the station manufacturer for a period of ten (10) years from the date of delivery. The vinyl siding shall be warranted for fifty years.

## **2 MATERIALS**

### **2.01 Packaged Station**

Provide (1) packaged hydropneumatic/re-chlorination station as manufactured by the following:

1. Engineering Fluid, Inc., or approved equal.

### **2.02 Building Enclosure**

- A. General.** The station building enclosures shall be a factory assembled, modular structure of two (2) compartments all attached to the station base structure and requiring no additional assembly at the job site.
- B. Design Criteria.** The building design criteria shall be:
1. To withstand snow load based on ASCE 7-05 Ground Snow Loads for the Clinton County, New York.
  2. To withstand wind loads based on ASCE 7-05 for wind speeds.
  3. Be designed for site specific seismic requirements based on local conditions as dictated by the Available Ground Motion Parameters according to ASCE 7 and 2010 Building Code of New York State established by zip code and a live floor load of 125 PSF.
- C. Sizing.** The modular building enclosing the station is shown at its minimum size so that National Standards mandated clearances are maintained above, below, and around equipment for proper and safe servicing, removal, and reinstallation of this equipment.

### **2.03 Structure**

- A. General.** All materials shall be specifically chosen to be resistant to moisture degradation and infestation and to be maintainable. The base substructure, building, and the means of attaching the building to the foundation shall be reviewed and stamped by a New York Registered Professional Engineer.
- B. Insulation.** Insulation values for the walls and roof structure shall be a minimum R-21 in the walls and the roof. Insulation within the roof and wall panels shall be foam-in-place polyurethane material applied between the interior and exterior sheathing forming a closed cell bounded by the steel framing. The insulation shall have an ASTM E-84 flame spread index of 25 and smoke developed of 450.
- C. Framing.** Building framing materials shall comply with the A.I.S.I. Specification for the Design of Cold-formed Steel Structural Members and to Standards ASTM C-955, ASTM C-1007, ASTM C-645, ASTM C-754 and ICBO 4782P and 4784P. The building structure shall be fabricated using steel C-studs as wall framing members and C-joists for roof support.

Openings in the sidewalls and/or roof shall be as shown and be fully framed out and supported using single or multiple framing members sufficient to support and fasten those devices or equipment items requiring a framed opening, these being access hatches, HVAC equipment, pipe passages, conduit passages, door and window openings and other special purpose openings as might be shown and required. The attaching of devices or equipment to the building at a framed opening shall be done fully according to the device manufacturer's mounting instructions.

**D. Sheathing.**

1. The exterior wall sheathing shall be 1/2" thick, exterior, CDX grade plywood.
2. The exterior roof sheathing shall be 5/8" thick, exterior, CDX grade plywood.
3. The interior wall and ceiling sheathing shall be 3/4" thick, exterior, CDX grade plywood.

**E. Mounting and Fastening.** The building shall be fabricated up from and securely attached to a framework fabricated of 2" x 6" steel tubing welded at each corner to form a base frame serving as a stable base for handling and transporting the building prior to attaching the building to the station base skid. The base frame shall be grit blasted to a SP-6 finish and coated with the specified coating material.

**F. Interior Surfaces.** All interior wall & ceiling surfaces shall be covered with .090" thick FRP (fiberglass reinforced plastic) sheeting of pebble grain, gloss, white finish. The individual wall faces shall be covered with one continuous sheet. The FRP sheets shall be glued to the gypsum sheathing requiring no fasteners. Corner moldings of like FRP material shall be installed & finished in a workmanlike manner.

**G. Exterior Treatment.** Exterior wall surfaces of the building shall be covered with vinyl siding. The siding shall have a rich wood grain finish that resembles rough-sawn oak. The siding shall have double nailing hems and locks to hold the panel flat and secure against the wall. The vinyl shall be .044" gauge. Vinyl siding color shall be selected by the Owner. The station manufacturer shall provide direction to a color chart.

**H. Roof.** The roof shall be constructed to provide a shed-style, single slope roof. The minimum roof slope shall be 3:12. For review by the Engineer-of-Record, the roof system shall be designed and stamped by a Registered Professional Engineer in the state of New York and provided with the equipment submittals.

**I. Building Substructure.** The base/floor system substructure shall be made up of steel plate and standard structural steel shapes of the sizes and weights sufficient to bear the loading placed on the base by shipping and operation. The substructure shall be designed to support the building live and dead loads plus the burden imposed by loading, transporting and unloading of this equipment.

All steel plates used in the substructure shall meet or exceed the requirements of ASTM-A36. The structural shapes (channels and angles) shall be of the thickness/weight as shown on the plans for this item and shall meet or exceed the requirements for ASTM A-36. The structural rectangular or square tubing shall be of the wall gauge as shown on the plans for this item and shall meet or exceed the requirements for ASTM A-500 Grade B.

- J. Skid Insulation.** The steel skid underside shall be insulated with an isocyanurate (flame retardant urethane) foam insulating material. The insulation shall be applied in each of the spaces between the structural members and the interior perimeter of the skid by spray and other approved methods. The insulation shall be 2 inches thick and have a minimum density (compressibility) of 1.7-1.8 lbs/cu. ft. nominal. The insulation shall have an ASTM E-84 flame spread rating of less than 30.

**K. Corrosion Protection.**

1. General. All interior and exterior surfaces of the exposed steel structure, transmission piping, and fittings shall be grit blasted equal to commercial blast cleaning (SSPC-SP6). Following fabrication all exposed surfaces of the station, interior and exterior, shall be coated according to the following requirements.
2. Weldment Prime Coating. All weldments will be pretreated by hand to provide additional corrosion protection using the same product as the base coat. Following the pretreatment full coating application shall take place.
3. Base Coating. The base coating shall take place immediately after surface preparation. The protective coating shall consist of a two-component, high solids, high build, fast drying epoxy system for protection and finishing of steel and having excellent corrosion resistant properties. The epoxy system shall be self-priming and require no intermediate coatings.
4. Finish Coating. Following the base coating application, a full finish coating application shall take place. The protective coating shall consist of a two-component, high solids, high build, fast drying epoxy system for protection and finishing of steel and having excellent corrosion resistant properties. The epoxy system shall be self-priming and require no intermediate coatings. The base and finish coats shall provide a total dry mil thickness of 8.0 mils.
5. Post Assembly Coating. Following assembly and just prior to shipping, there shall take place a thorough cleaning of the floor of the station followed by a rolled on coating of the two part epoxy coating to cover over any scuffing or scaring that might have occurred during assembly.
6. Chemical Feed Room Floor. The top of the steel floor plate shall be sprayed with a fiberglass protective coating. The coating shall be a minimum of 1/8" of fiberglass reinforced polyester resin applied over the 1/4" steel floor plate. The exterior surface is 30 percent chopped glass and 70 percent resin. Once the reinforced coating has cured, a UV stable gel coat finish will be applied to the surface to protect the coating and provide color. The finish coat will be white in color and will have a sand additive added in the coating system to provide a non-slip finish.

**2.04 Components**

- A. Heavy Duty Aluminum Doors.** Doors, single and double leaf and of the size shown on the plans, shall be manufactured of 18-gauge galvanized steel. All doors shall be full flush construction and 1-3/4 inches thick. Doors shall be reinforced, stiffened, insulated, and sound deadened with a solid polystyrene foam board permanently bonded to the inside of each face skin. The lock and hinge edge of each door shall be welded with a center hairline seam the full height of the door. Lock edge shall be reinforced full height by a 14-gauge continuous one-piece channel extruded templating. The hinge edge shall be reinforced full height by a 14-gauge continuous one-piece channel, formed and tapped for hinges. Top and bottom of the door shall be closed with 16-gauge

channels. Doors shall be thoroughly cleaned and receive an iron phosphate treatment prior to receiving one coat of prime paint. Door closures and rim panics are reinforced with 14-gauge channels.

Doors shall be fully-mounted in frames produced for pre-hanging of commercial 1-3/4" doors. Frames are formed to 16-gauge commercial quality cold rolled steel conforming to ASTM A366 or A620 and A568. Frames are produced in two welded units, to be mechanically joined during installation. The base side is prepared for all required hardware. Both units, base and trim, are furnished with welded mitered faces. Frame anchoring includes compression anchors and stud screws. Door hinges shall be continuous gear hinges, fabricated of extruded 6063-T6 aluminum alloy/temper with pin-less assembly. The doors shall have a lockset, exterior handle, and top mounted-door closer with a hold-open device.

Doors and frames shall be finished with a two-component, aliphatic/acrylic polyurethane coating, white in color, with a high gloss finish. The coating shall be resistant to a wide range of solvents and chemicals under splash and spill conditions. The coating system shall be V.O.C. compliant.

- B. Floor Drain.** The station shall have floor drains as shown on the contract plans. The floor drains shall be a 4" grated opening with 4" I.D threaded hub for connection of a drain line up under the station floor. Plastic drain pipe and fittings shall conform to the material requirements of ASTM D1784 and shall be manufactured in accordance with ASTM D2241 for SDR 26 PVC pipe.
- C. Safety Floor Matting.** The walkway areas shall be covered with a rubber drainage runner. The runner shall be medium duty, 1/2 inch minimum thickness of open slot design allowing fluids to drain understanding or walking surfaces. The runner shall have a tread design to promote sure footing. The underside of the runner shall have a raised knob design to permit aeration and drainage, and to reduce runner fatigue. The runner shall not be glued to the floor.
- D. Restraining Points.** The main inlet and outlet piping to the station shall each be provided with two (2) or four (4) restraining points as welded on "eyes" or similar device welded to the underside of the base structure framing, or the capsule wall adjacent to the pipe penetration as shown to facilitate the attachment of joint restraint tie rods or other device to be used in retarding any pipe movement at the connections.
- E. Adaptors and Couplings.** All plumbed devices within the station eventually requiring service, such as meters, control valves, pumps and like equipment, shall be easily removed from the piping by the presence of appropriately placed and sufficient quantity of adaptors and couplings as shown on the plans; no less than the quantity of couplings and adaptors shown shall be allowed.

The station piping shall include a variety of compression type, flexible couplings to prevent binding and facilitate removal of associated equipment. These couplings are to be where shown on the plans. In lieu of a compression coupling, a flanged coupling adapter (FCA) may be used.

All compression couplings or flanged coupling adapters (FCA), and flexible connectors/expansion joints shall include a minimum of two (2) zinc coated steel threaded rods across the joint with appropriate bolted restraining points.

- F. Pressure Gauges.** Combination pressure gauges shall have a built-in pressure snubber and have 4-1/2" minimum diameter faces and turret style case, black fiberglass-reinforced thermoplastic with a clear acrylic window with Buna-N gasket. The gauge shall have a 1/4" MNPT lower mount process connection and contain a 0.6mm copper alloy restrictor. Gauge ranges shall be 0 to 300 psi for each of the inlet and outlet gauges for the station.

All gauges will be panel mounted off the pipeline and be connected to their respective sensing point. The gauge trim tubing shall be complete with both isolating and vent valves and the tubing shall be so arranged as to easily vent air and facilitate gauge removal. Gauges mounted directly to the pipeline or at the sensing point will not be accepted. Gauge ranges, markings and gauge location shall be identified in the submittal documents.

- G. Static and Sensing Lines.** All gauge, switch, and transmitter sensing lines shall be minimum 1/4" OD white polypropylene tubing run from the sensing point and a ball valve to the point of device mounting.

The pilot tubing shall be run in a workmanlike manner with elastomeric/stainless steel mounting straps to securely hold the tubing to be free of stress and vibration. The alignment and organization of the sensing lines shall be continuously rising.

- H. Sample Tap.** A single, right angle outlet, smooth nose, brass sample tap shall be affixed to the manual vent ball valve for the low suction lockout and suction pressure gauge assembly.
- I. Hose Bibb.** There shall be provided a standard hose bibb with valve and vacuum breaker on the suction piping. The hose bibb connection shall be through a pressure regulator.
- J. Magnetic Flowmeter.** There shall be furnished a 3 inch electromagnetic flow meter suitable for fixed-site measurement of bi-directional flow in a full pipe. The flow meter shall consist of a flow tube and a flow transmitter, which shall transmit flow. The flow tube shall use a spool piece configuration with field-interchangeable sensors containing coils and electrodes.

Flow meter shall be a 3-inch Endress and Hauser Proline Promag Model 50W80, or approved equal. The meter is designed to hold the stated accuracy limits to two (2) upstream and five (5) downstream pipe diameters of straight pipe length approaching and leaving the meter. The flow meter shall be rated for a maximum working pressure of 285 psi.

1. Flow Tube and Sensors. The spool piece flow tube shall be made of carbon steel and shall be powder coated with a corrosion resistant electrostatic epoxy finish inside and outside, and shall include Type 316 stainless steel bolts. O ring seals shall be made of Viton, and standpipe gaskets shall be made of nitrile rubber. The flow tube shall be supplied with ANSI 150 flanges.

Each flow sensor shall contain a coil, a pair of sensing electrodes, and an integral grounding electrode. External grounding rings and straps shall not be necessary. The sensors shall use solid state design, with the coils, electrodes, and other sensor components encapsulated in fluoride PVDF. The sensors shall be field replaceable and field-interchangeable without the need for recalibration. The electrodes shall be made of Type 316 stainless steel.



2. **Flow Transmitter.** The flow transmitter shall be microprocessor-based, and shall contain a keypad and a 2 line, 32 character, backlit alphanumeric liquid crystal display (LCD) with characters 0.3 in. (8 mm) high and 0.2 in. (5 mm) wide. The LCD shall visually prompt the user through the programming sequence, and the flow transmitter shall include a built-in help system. The LCD shall display flow rate and/or total flow in user-selectable units of measure. The flow transmitter shall be capable of displaying forward, reverse, net and grand total flows, and the totalizers shall be resettable or non-resettable.

The flow transmitter shall be housed in a rugged, watertight, dust-tight, corrosion resistant (NEMA 4X, IP67) cast aluminum, epoxy painted enclosure suitable for conduit connections. The enclosure shall include a clear polycarbonate window for viewing the LCD without opening the enclosure.

The wiring from the flow transmitter to the sensors shall be 3 separate 2-conductor cables, 18 gauge, twisted and shielded. All wiring from the flow transmitter to the sensors shall be provided and sized to reach from the flow tube to the flow transmitter without splices. The flow transmitter shall be wall mountable.

- K. Hydro-pneumatic Tanks.** The station shall be complete with two (2) ASME approved bladder type hydro-pneumatic tanks, as shown in the plans. The volume of each storage tank will be a minimum of 211 gallons and rated for a maximum working pressure of 250 psi.

The hydro-pneumatic storage tank shall feature deep drawn steel upper and lower domes with side shell construction specifically designed for bladder type storage tanks. Storage tank welding shall be carefully done to eliminate rough spots and sharp edges. The storage tank base shall be designed so as to permit free airflow to prevent moisture from accumulating beneath the storage tank.

The hydro-pneumatic storage tank shall have a heavy-duty butyl bladder that effectively separates the air chamber from the water chamber. The shape of the bladder shall conform exactly to the shell configuration and shall be of seamless construction meeting FDA requirements for potable water. The bladder shall be replaceable.

1. Approved Manufacturer:
  - a. Thrush Co. Inc. FXA 800L, or approved equal.

- L. Emergency Shower/Eye Wash.** An emergency shower with eye wash shall be provided. The unit shall be heavy wall Schedule 80 hot-dip galvanized piping, with high-visibility yellow stainless steel spray head, catch basin, stainless steel pull actuators, 8" flanges for secure floor mounting, stay-open valve and emergency sign. Unit shall comply with ANSI Z358.1-1998.

1. Approved manufacturer:
  - a. Bradley Model S19-310UU, or approved equal.

## 2.05 Sodium Hypochlorite Chemical Feed System

- A. General.** Within the compartment set up for liquid chlorine solution feed, the station manufacturer shall provide the complete metering pump and pump control system skid mounted on rigid

polypropylene sheeting, in volume proportional to flow of the station, with feedback from the chlorine analyzer.

The chemical skid shall be constructed from Black Polypropylene sheet with a minimum trade thickness of 3/8". All components of the chemical metering system shall be contained within the skid. The piping system shall include a calibration column, diaphragm protected pressure gauge, a pressure relief valve, and a back pressure valve. Piping shall include isolation valves and unions for all serviceable components. Seals and O-rings shall be FKM (Viton) for compatibility with sodium hypochlorite.

**B. Chlorine Analyzer.** A chlorine analyzer/controller shall be supplied and installed by the pump station manufacturer. The system shall sample continuously through the use of modular, potentiostatic measuring cells. The controller shall be designed to carry out high-precision measurements and controls of chlorine and pH. Chlorine analyzer sample discharge shall be piped to the floor drain within the pressure reducing and hydropneumatic tank room.

1. Approved manufacturer:

- a. Grundfos Conex Dia-2Q Model DIA-2Q-A,D1-AU-PT-QS-T,W-H, with AquaCell D1, or approved equal.

**C. Positive Displacement Pumps.** Two pumps shall be supplied. One (1) pump shall be installed on the polypropylene skid by the pump manufacturer and the second shall be supplied as a spare for system redundancy. Chemical metering pumps shall be mechanically actuated diaphragm positive displacement, motor driven, metering pump. Pumps shall be driven by a microprocessor controlled stepper motor providing a minimum of 3000:1 turndown ratio. Each pump shall have a maximum capacity of 2 GPH at 230 PSI. The pump's stroke length shall operate at 100% stroke length throughout the pumps operating range. No adjustment to the stroke length, to regulate flow, or for other reasons is acceptable.

The pump shall be capable of accepting a 4-20 mA input for automatic proportional feed control. In proportional milliamp mode (4-20 mA) pumps shall be capable of -999 to +999 proportional band providing infinite turn up and turn down capabilities.

Pump shall operate on power supplies ranging from 120 VAC, single phase AC power. Pump body and electronics shall be protected by IP65 and NEMA4X rated enclosures for dust proof, wash down duty operation.

1. Pump wet end shall be constructed as follows:

- a. PVFD: Head and Fittings
- b. FKM: Elastomers
- c. PTFE: Diaphragm
- d. Ceramic: check valve balls

2. Approved manufacturer:

- a. Grundfos Model DDA 7.5-16 FC-PV/V/C-F-311003BG, or approved equal.

- D. Chemical Feed Piping.** All piping shall be polyethylene tubing routed within Schedule 80 PVC and installed by the station manufacturer. Piping shall be designed and installed to provide optimum pump operation and ease of maintenance. Piping system shall be specifically designed to reduce the entrance of bubbles to pump suction. Pressure relief piping shall provide operator with visual indication of relief without spillage. Piping configuration shall vent pressure relief and calibration column to sight glass and storage tank.
- E. Calibration Column.** A clear PVC bodied calibration column shall be provided and skid mounted. The calibration column shall be composed of a 500ml graduated cylinder with 5ml divisions and .75" NPT threaded top and bottom.
- F. Pressure Gauge.** A diaphragm protected, 0-300 PSI, 2.5" stainless steel bodied, glycerin filled pressure gauge shall be provided to monitor chemical feed system pressure. A PVC bodied, gauge protector with viton diaphragm shall be provided to prevent process fluid from entering the gauge. The space between the gauge and the diaphragm shall be vacuum filled with glycerin to hydraulically transfer system pressure to gauge.
- G. Valves and Fittings.** Integral back-pressure/anti-siphon, pressure relief, and ball valves shall be furnished and installed as shown on the contract documents or as specified herein. The back-pressure and pressure relief valves shall be fully adjustable from 10-250 psi. Unless otherwise indicated, all valves shall be true-union type.
- A corporation stop and integrated quill shall be provided for connecting solution piping to process piping at the application point shown on the plans. The corporation stop shall be complete with a 316SS locking chain, and allow for quill servicing without having to shut down the process main line. The chemical injection quill shall be constructed of PVC and shall have an integral removable spring loaded ball check. Stinger length shall be based on the diameter of the process pipe. The injection quill shall be rated for a maximum pressure of 250 psi.
- H. Junction Box.** A NEMA terminal box shall be provided on the skid panel for termination of all wiring. A power outlet with weatherproof cover shall be provided for the metering pumps.
- I. Chemical Storage Tank.** A bulk storage tank shall be a cylindrical, cone bottom, open top tank. The bulk storage tank shall be provided to store a minimum of 30 gallons. The tank material shall be linear polyethylene, and shall be complete with a polyethylene stand.
- J. Chemical Storage Tank Sensor and Controller.** The tank shall be equipped with an ultrasonic liquid level sensor, such that when the level in the tank falls to a minimum level, the sensor controller will relay a signal to the PLC to acknowledge the need to replenish the hypochlorite solution within the tank.
- K. Containment Pallet.** There shall be provided one (1) spill containment pallet made up of a basin and a grated nested cover of sufficient size and strength to support 50 gallons of liquid hypochlorite in a drum. The pallet and grated cover shall be of a plastic or resin based material unaffected by the prolonged contact with sodium hypochlorite. The pallet and grate shall be washable.

## 2.06 Piping

- A. Internal Piping.** Piping supplied by manufacturer shall be steel and conform to material specification ASTM A-53(CW) for nominal pipe size four (4) inch and smaller and ASTM A-53(ERW) Grade B for nominal pipe size five (5) inches and larger. Steel butt-welding fittings shall conform to material specification ASTM A-234 Grade WPB and to the dimensions and tolerances of ANSI Standards B16.9 and B16.28 respectively. Pipe and fittings shall conform to the requirement of AWWA C208 and shall be coated and lined in conformance with AWWA C205.

Forged steel flanges shall conform to material specification ASTM A-105 Class 60 and/or ASTM A-181 for carbon steel forgings and to the dimensions and tolerances of ANSI Standards B16.5 as amended in 1992 for Class 150 flanges. Pipes 10 inch and smaller shall be Schedule 40.

- B. Buried Piping.** Piping supplied by Contractor shall be ductile iron pipe conforming to the requirements of ANSI A21.51 and have a wall thickness Class 52. Fittings shall be cast or ductile iron conforming to ANSI/AWWA C153/A21.53 and utilize mechanical joints in accordance with ANSI/AWWA C111/A21.11. All ductile iron pipe and fittings shall be furnished with a seal coated double thickness cement mortar lining of 1/8 inches conforming to ANSI/AWWA C104/A21.4. Pipe zone bedding shall be select granular fill in accordance with Section 203 *Excavation and Embankment*.

- C. Interior Coating.** The internal surfaces of piping to be fusion bonded coated shall be grit blasted to an SP-10 finish with the finish profile required by the coating material manufacturer. The internal, wetted surfaces of the steel transmission piping shall have applied to it a Fusion Bonded Epoxy Coating on the interior pipe surface. The coating shall be applied and meet the testing requirements of AWWA C213. The powder coating product shall be National Sanitation Foundation (NSF) Standard 61 certified material. The epoxy powder coating shall be Tnemec Series FC20, or approved equal.

Prior to shipment of the station, the station manufacturer shall provide in writing to the Engineer certification that the fusion bonded epoxy coating has been applied to all internal surfaces of the steel piping using the proper method. Said certification shall show under the station manufacturer's letterhead:

1. Date of application.
  2. Material manufacturer and product designation including a product data sheet for the coating.
  3. Applier of the fusion bonded coating, name, address and phone number.
  4. Notarized signature of an officer of the station manufacturing company stating the fusion bonded epoxy coating was applied to AWWA Standard C213-91 or the latest revision.
- D. Floor Penetrations.** Where suction and discharge piping, or any other pressure piping, passes through the station floor plate and base sub-structure, that area of the floor shall be provided with a grout sleeve made up of steel pipe of 9" height and of sufficient annular diameter to pass a full size pipe flange for the pipe size shown.

The steel sleeve shall be welded into the floor plate with a 1" projection above the floor in the station. Following installation of the inlet and outlet pipes, the installing Contractor shall be responsible for furnishing and installing grout to close the opening around the installed pipe.

- E. Wall Penetrations.** Where transmission pipes pass through walls, the passage shall be by having the pipe with a weld sleeve pass through and be welded to a steel plate. The pipe passage plate shall extend down and be welded to the floor.

The pipe passage plate shall have welded to it on the three sides a channel iron frame which shall accept the building wall set into the channel flanges to lap over the building wall. Where the flange overlaps the building wall, the edge of the channel flange shall be caulked to the wall on all three edges on both sides of the wall.

## 2.07 Pipe Supports

- A. General.** Pipe supports by minimum sizing:
1. 8 inch or less piping shall be 2" x 3" x 3/16" wall rectangular tubing.
  2. 10" and larger piping shall be 3" x 4" x 1/4" wall rectangular tubing.
  3. 6 inch or larger piping shall be provided with "kick" bracing projecting fully from the underside of the pipe to the floor at an angle of no less than 15° from vertical out at a right angle to the run of the pipe being supported. These "kick" braces shall be in addition to the vertical pipe supports called out above.
- B. Riser Pipe Vertical Supports.** All of the inlet and outlet vertical riser pipes shall be provided with two (2) structural steel angle pipe supports welded from the floor to weldment plates on the vertical pipes. These supports shall be opposed by at least 120° around the pipe. The minimum member size for these supports shall be 3"x 4" x 1/4" tubular steel.
- C. Welding.** Pipe supports are to be fully welded at both end points to the pipe and steel floor where required. Where components are to be supported and may require disassembly at some time, the supports for these components shall be welded at the bottom and bolted at the top by use of a bolt yoke welded to the top of the support and bolted into the flange connection picking up at least three bolts.

## 2.08 Valves

- A. General.** All valves shall be certified to NSF/ANSI 61, Drinking Water System Components – Health Effects, and certified to be Lead-Free in accordance with NSF/ANSI 372. All valves shall conform to all applicable AWWA standards.
- B. Ball Valves.** For piping of less than 3" size, ball valves shall be used. The ball valves shall meet or exceed ASTM Spec B124 No. C37700. The ball valves will be 2-piece forged brass body, blow out proof stem, TFE seats, TFE packing with adjustable stem packing gland. The valves will be NPT threaded pattern complete with lever operators. Maximum working pressure shall be 600 psi.
- C. Butterfly Valves.** Butterfly valves shall conform to the requirements of AWWA C504, shall be wafer style for ANSI Class 125/150 flange bolting, and have a metal reinforced, dovetail seat for

drip-tight, bi-directional shutoff. The valve shall be manufactured for a working pressure of 280 psi. The valve stem shall be one piece connected to the disk by stainless steel torque plugs with upper and lower RTFE inboard stem bearings and heavy duty upper stem bushing. The valve body shall be cast iron with stainless steel disk and stem, EPDM seat, polyester upper stem bushing and NBR stem seal.

Valves 6" and smaller shall be equipped with a lever operator with 10 degree throttle stops capable of withstanding 450 ft. lbs. of input torque and mounted to the valve trunnion with 4 bolts. Valves 8" and larger valves shall be equipped with a weatherproof, heavy duty travelling nut style hand-wheel operators capable of withstanding 450 ft. lbs. of input torque and mounted to the valve trunnion with 4 bolts.

1. Approved manufacturer:
  - a. Keystone 221-786, or approved equal

**D. Pressure Relief Valve.** Pressure relief valves shall conform to the requirements of AWWA C530. The valve configuration as shown shall be hydraulically operated, single diaphragm actuated. The valve shall consist of three major components: the body with seat installed, the cover with bearing installed, and the diaphragm assembly. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve, separating operating pressure from line pressure. Packing glands and/or stuffing boxes are not permitted and there shall be no pistons operating the main valve or pilot controls. Valve body and cover shall be epoxy coated. The stainless steel seat with integral bearing shall be of the solid, one piece design.

The diaphragm assembly shall contain a non-magnetic stainless steel stem of sufficient diameter to withstand high hydraulic pressures. The stem shall be fully guided through its complete stroke by a removable bearing in the valve cover and an integral bearing in the valve seat. No center guides shall be permitted. The stem shall be drilled and tapped in the cover end to receive and affix such accessories as may be deemed necessary.

The flexible, non-wicking, FDA approved diaphragm shall consist of nylon fabric bonded with synthetic rubber compatible with the operating fluid. The diaphragm shall be fully supported in the valve body and cover by machined surfaces which support no less than one-half of the total surface area of the diaphragm in either the fully open or fully closed position.

The pilot control system shall include CK2 isolation valves. The pilot system shall include closing speed control on all valves. Pilot controlled sensing shall be upstream of the pilot system strainer so accurate control may be maintained if the strainer is partially blocked.

The pressure relief pilot shall be a direct-acting, adjustable, spring-loaded, diaphragm valve designed to permit flow when controlling pressure exceeds in the adjustable spring setting. The pilot control is normally held closed by the force of the compression on the spring above the diaphragm and it opens when the pressure acting on the underside of the diaphragm exceeds the spring setting. The pressure relief valve shall be supplied with the Dura-Kleen® stem (KD option).

The 2-inch pressure relief valve shall be field-set to 5 psi above the 4-inch mainline pressure reducing valve set point.

1. Approved manufacturer:
  - a. Cla-Val Model 50-01, or approved equal.

**E. Pressure Reducing Valve.** Pressure reducing valves shall conform to the requirements of AWWA C530. The valve configuration as shown shall be hydraulically operated, single diaphragm actuated. The valve shall consist of three major components: the body with seat installed, the cover with bearing installed, and the diaphragm assembly. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve, separating operating pressure from line pressure. Packing glands and/or stuffing boxes are not permitted and there shall be no pistons operating the main valve or pilot controls. Valve body and cover shall be epoxy coated. The stainless steel seat with integral bearing shall be of the solid, one piece design. The valve shall be manufactured with anti-cavitation trim to eliminate damage associated with cavitation.

The diaphragm assembly shall contain a non-magnetic stainless steel stem of sufficient diameter to withstand high hydraulic pressures. The stem shall be fully guided through its complete stroke by a removable bearing in the valve cover and an integral bearing in the valve seat. No center guides shall be permitted. The stem shall be drilled and tapped in the cover end to receive and affix such accessories as may be deemed necessary.

The flexible, non-wicking, FDA approved diaphragm shall consist of nylon fabric bonded with synthetic rubber compatible with the operating fluid. The diaphragm shall be fully supported in the valve body and cover by machined surfaces which support no less than one-half of the total surface area of the diaphragm in either the fully open or fully closed position.

The pilot control system shall include CK2 isolation valves and X46 flow clean strainer. The pilot system shall include an opening and closing speed control on all valves. Pilot controlled sensing shall be upstream of the pilot system strainer so accurate control may be maintained if the strainer is partially blocked.

The pressure reducing pilot control shall be a direct-acting, adjustable, spring-loaded, normally open, diaphragm valve designed to permit flow when controlled pressure is less than the spring setting. The pilot control is held open by the force of the compression on the spring above the diaphragm, and it closes when the delivery pressure acting on the underside of the diaphragm exceeds the spring setting. The pilot control system shall include a fixed orifice.

The 1-inch bypass pressure reducing valve shall be field-set to 50 psi. The 4-inch mainline pressure reducing valve shall be field-set to 5 psi above the bypass valve set point.

1. Approved manufacturer:
  - a. Cla-Val Model 690-01KO (Mainline Valve) and Model 90-01KO (Bypass Valve), or approved equal.

## 2.09 Electrical

- A. Design, Assembly and Test.** The electrical apparatus and control panel design, assembly, and installation, and the integration of component parts will be the responsibility of the manufacturer of record for this equipment. That manufacturer shall maintain at his regular place of business a complete electrical design, assembly and test facility to assure continuity of electrical design with equipment application. Control panels designed, assembled or tested at other than the regular production facilities or by other than the regular production employees of the manufacturer of record for this equipment will not be approved.
- B. Conformance to Standards.** The manufacturer of electrical control panels and their mounting and installation shall be done in strict accordance with the requirements of UL Standard 508A and the National Electrical Code (NEC), NFPA 70 latest revision so as to afford a measure of security as to the ability of the eventual owner to safely operate the equipment. No exceptions to the requirements of these codes and standards will be allowed; failure to meet these requirements will be cause to remove the equipment and correct the violation.
- C. U.L. Listing.** All service entrance, power distribution, control and starting equipment panels shall be constructed and installed in strict accordance with Underwriter's Laboratories (UL) Standard 508A "Industrial Control Equipment." The UL label shall also include an SE "Service Entrance" rating stating that the main distribution panel is suitable for use as service entrance equipment. The panels shall be shop inspected by UL, or constructed in a UL recognized facility. All panels shall bear a serialized UL label indicating acceptance under Standard 508A and under Enclosed Industrial Control Panel or Service Equipment Panel.

A photocopy of the UL labels for this specific project shall be transmitted to both the project engineer and the Contractor for installation within their permanent project files, prior to shipment of the equipment covered under these specifications.

- D. E.T.L. Listing.** All control panels shall be E.T.L. Listed by Interek Testing Services (ITS) under the Industrial Control Panel (ICP) Category. Each completed control panel shall bear an ETL listing label stating that the panel conforms to UL STD 508A and is certified to CAN/CSA STD C22.2 NO. 14. The listing label shall include the station manufacturer's name, address and telephone number. The station manufacturer shall have quarterly inspections performed by ETL at the manufacturer's facility to ensure that the products being listed comply with the report and procedural guide for that product.
- E. Grounding.** Each electrical equipment item in the station shall be properly grounded per Section 250 of the National Electrical Code. Items to be grounded include, but are not limited to, pump motor frames, control panel, transformer, convenience receptacles, dedicated receptacle for heater, air conditioner, dehumidifier, lights, light switch, exhaust fans and pressure switches.

All ground wires from installed equipment shall be in conduit and shall lead back to the control panel to a copper ground buss specific for grounding purposes and so labeled. The ground buss shall be complete with a lug large enough to accept the installing electrician's bare copper earth ground wire. The bus shall serve as a bond between the earth ground and the equipment ground wires.



- F. Panel Mounting Hardware.** Metal framing channel and hangers shall be used exclusively for mounting of electrical panels and electrical components except for those specifically designated otherwise. When mounting panels in buildings with  $\frac{3}{4}$ " plywood interior sheathing, certain panels and components may be mounted by screwing these devices into the wall. The maximum weight of a panel mounted with four lag screws cannot exceed 250#. The lag screws must either be  $\frac{5}{16}$ " or  $\frac{3}{8}$ " diameter and be fully threaded.
- G. Electrical Service.** The electrical service provided for the hydro-pneumatic/re-chlorination station shall be 240/120 volt, 1 phase, 60 Hertz, 3 wire.
- H. Circuit Breaker Panel.** All circuit breakers, relays and controls shall be incorporated into one (1) NEMA 1 control panel.

There shall be provided, thermal-magnetic trip circuit breakers as follows:

1. Twelve (12) Auxiliary Circuit Breakers:
  - 1.1p, 15amp Controls
  - 2.1p, 15amp Lights
  - 3.1p, 15amp Convenience Outlets
  - 4.1p, 15amp Chemical Pumps
  - 5.1p, 15amp Dehumidifier
  - 6.2p, 20amp Heater for Control Room
  - 7.2p, 20amp Heater for Chemical Room
  - 8.1p, 15amp Ventilation Fan
  9. Three (3) Spare

- I. Control Panel.** All relays and controls shall be incorporated into one (1) NEMA 1 control panel.
- J. Interior Electrical Conduit and Wiring.** All service entrance conduits power and signal, shall be rigid steel conduit, individually sized to accept the inbound service conductors, fiber optic, and telephone cables.

These service entrance conduits shall be installed from the main power or control panel through the capsule steel sidewall or the building floor and terminate exterior to the equipment enclosure as a thread hub. The service entrance exterior conduit connection points shall be capped or plugged for shipment.

All wiring within the equipment enclosure and outside of the panel enclosures shall be run in conduit except where watertight flexible conduit is properly used to connect pump drivers, fan motors, solenoid valves, limit switches, etc., where flexible connections are best utilized.

Devices and appliances where furnished by the original manufacturer and being equipped with a UL approved rubber cord and plug, may be plugged into a receptacle. Equipment enclosure conduits shall be rigid, heavy wall, Schedule 40 PVC with solvent weld moisture proof connections, in minimum size  $\frac{3}{4}$ " or larger, sized to handle the type, number and size of equipment conductors to be carried.

The conduiting shall be in compliance with Article 347 of the National Electrical Code and NEMA TC 2, Federal WC 1094A and UL 651 Underwriters Laboratory Specifications. Where flexible conduit connections are necessary, the conduit used shall be Liquid tight, flexible, totally nonmetallic, corrosion resistant, nonconductive, U.L. listed conduit sized to handle the type, number and size of equipment conductors to be carried in compliance with Article 351 of the National Electrical Code.

Motor circuit conductors shall be sized for load. All branch circuit conductors supplying a single motor of one (1) horsepower or more shall have an ampacity of not less than 125 percent of the motor full load current rating, dual rated type THHN/THWN, as set forth in Article 310 and 430 B of the National Electrical Code, Schedule 310 13 for flame retardant, heat resistant thermoplastic, copper conductors in a nylon or equivalent outer covering.

Control and accessory wiring shall be sized for load, type MTW/AWM (Machine tool wire/appliance wiring material) as set forth in Article 310 and 670 of the National Electrical Code, Schedule 310 13 and NFPA Standard 79 for flame retardant, moisture, heat and oil resistant thermoplastic, copper conductors in compliance with NTMA and as listed by Underwriters Laboratories (AWM), except where accessories are furnished with a manufacturer supplied UL approved rubber cord and plug.

- K. Gauge Pressure Transmitters.** Pressure transmitters shall be supplied to measure the inlet and outlet pipeline pressure. The transmitters shall sense gauge pressure and transmit a 4-20 mA dc signal. The instruments shall measure pressure of a predetermined span. Range is to be fully adjustable throughout using allowable span and range limits. The accuracy shall be  $\pm 0.20\%$  of span.

Each transmitter shall provide an analog output and include a standard LCD with pushbuttons to provide intelligent transmitter configuration directly from the on-board pushbuttons. The two-line digital indicator shall display the measurement in any selected units. The pushbuttons shall provide calibration of zero and span, setting of linear output, forward or reverse direction, external zero enable or disable, damping, failsafe action and local display including upper and lower range value selection.

All process-wetted parts of each instrument shall be Type 316L stainless steel. The transmitter shall be protected by a gasketed, weatherproof NEMA 4X enclosure. The transmitter shall be approved for use in hazardous locations (Nonincendive for Class 1 and Class II, Division 2 locations; intrinsically safe or explosion-proof for Class 1 and Class II, Division 1 locations).

The transmitter shall have 1/2 inch NPT female threaded tapping ports.

1. Approved manufacturer:
  1. Foxboro Series IGP10, or approved equal.

- L. Station Exterior Lighting.** An exterior light shall be provided as located on the plans. The light shall be LED lighting source. Housing shall be one piece, injection molded, bronze polycarbonate. A button type photo control shall be provided.

- M. Station Interior Lighting.** There shall be one or more LED fixtures, enclosed and gasketed, forty eight (48) inch minimum light fixtures installed within the equipment enclosure, as shown on the

plan for this item. The light switch shall be of the night glow type and be located conveniently adjacent to the door. Open fluorescent or incandescent fixtures will not be accepted.

**N. Dehumidifier.**

1. One (1) installed as shown.
2. Capacity 30 pints per 24 hours.
3. Compressor rated 115 volts, 60 Hz, 4.3 operating amps.
4. 106 CFM fan, 2 fan speed.
5. Humidity range 35 to 80% RH, ambient temperature range of 41 to 95 F, Type R410A refrigerant.
6. Washable filter.
7. Condensate piped direct to drain.
8. UL listed rubber cord.

**O. Heaters.**

1. Quantity as shown on the plans, wall mounted as shown.
2. Rating - 10,239 BTU/HR - 3000 watts, 240 volt.
3. Enclosed resistance wire within steel finned element.
4. Control - thermostat.
5. UL listed.
6. Fan forced.
7. Hard wired in conduit per UL 400-1.

**P. Exhaust Fan**

1. Two (2) installed as shown.
2. Capacity each 470 CFM of free air at 0.125 inch static pressure.
3. 120 volt, 60 Hz, 1550 rpm, totally enclosed, shaded pole, sleeve bearing motors, Class A insulation.
4. Gray polyester coated steel guard.
5. Cold rolled galvanized steel frame.
6. 12" diameter, stamped aluminum, 3-blade propeller.
7. Hard wired in conduit to conduit box on motor per UL 400-1.
8. UL Listed.
9. 120 volt AC operation from wall mount thermostat and HAND/AUTO switch on main control panel.
10. One (1) 12" x 12" automatic shutter with exterior mounted, aluminum shroud and insect screen.

**2.10 Exterior Electrical Service, Fiber Optic, and Telephone Connection.**

**A. Electrical Connection.**

1. General. The Contractor shall be required to make a complete electric service connection from the existing NYSEG electric pole as shown on the contract Drawings, and as specified herein. The electric service connection shall include:
  - a. Pole Riser Connection
  - b. Raceway System including conduit and wiring.
  - c. Grounding of electrical components

- d. Mounting a Meter and Meter socket per Utility requirements and the Drawings
  - e. All additional required work as shown on the plans, as specified by the station Manufacturer, and/or as ordered by the Engineer to fully complete the electric service connection.
2. Electrical Service. The electrical service provided for the booster pumping station shall be 480 volt, 3 phase, 60 Hertz, 4 wire.
- B. Telephone Line Connection.** The Contractor shall install a buried conduit with pull string for telephone line connection to the station. The Contractor shall coordinate with the Town, Verizon, and station manufacturer to complete the installation of the conduit, telephone line and autodialer system hookup as shown on the plans and/or as ordered by the Engineer.
- C. Fiber Optic Connection.** The Contractor shall install a buried conduit with fiber optic cable for the communication between the above-grade stations. The Contractor shall coordinate with the station manufacturer on conduit penetration locations and complete the installation of the conduit and cable, and make connections to the patch panel and media converter supplied by the manufacturer, as shown on the plans and/or as ordered by the Engineer.
- D. Raceway Systems.** As required by the NEC (minimum) with oversized raceways as indicated and where required for ease of pulling cable. Minimum conduit size: 3/4-inch, unless indicated otherwise.
- 1. Raceway Types. Rigid galvanized steel conduit, electrical metallic tubing (EMT), flexible steel conduit, liquid-tight flexible steel conduit and Schedule 40 heavywall and Schedule 80 extra-heavywall rigid non-metallic (PVC) conduit, conforming to applicable ANSI, NEMA and UL standards.
  - 2. Fittings. All raceway fittings (except for rigid non-metallic conduit) to be steel or malleable iron, and UL-listed for the intended application. EMT fittings to be compression type.
  - 3. Pull and Junction Boxes, and Wireways: Use as indicated and required. Junction and pull boxes for general indoor use (dry locations) to be of galvanized code gauge steel construction, minimum 4" square by 1-1/2" deep, with screw-on covers. Wireways to be UL listed, sheet steel construction with screw-on covers.
  - 4. For exterior and damp or wet indoor locations, use boxes and wireways approved for such use.
  - 5. Handholes: Light-weight and high-strength, constructed of fiberglass reinforced polymer concrete, gray color, suitable for use at temperatures down to -50°F, and resistant to sunlight, weathering, chemicals and freeze-thaw cycles, with bolt-on cover (with standard logo indicating type of service), and designed for in-grade use in areas with light vehicular traffic (5,000 lb. load over 10"x10" area). Acceptable Manufacturers: Quazite "Composolite," Styles "PC" or "PG", or approved equal.
  - 6. Pipe Sleeves: Rigid steel conduit or iron pipe.
  - 7. Conduit Seals: For Cast-in-Place Concrete Applications: Acceptable Manufacturers: O-Z/Gedney Type "FSK"; Thunderline Corp. "Link Seal" with "Link Seal Wall Sleeve", or approved equal. For Core Drilled and Pre-Cast Opening Applications: Acceptable Manufacturers: O-Z/Gedney Type "CSML"; Thunderline corp. "Link Seal", or approved equal.

8. Pull Wires: No. 14 AWG zinc-coated steel monofilament plastic line with 200 lb. tensile strength.
- E. 600 Volt Class Wire.** All wire and cable shall be constructed in accordance with all applicable ICEA, NEMA and IEEE published standards, and shall be UL-listed and labeled. Single-conductor, 98% conductivity, annealed, uncoated copper conductors with 600-volt rated type “THHN/THWN” insulation. Wire shall be annealed bare copper per ANSI/ASTM B3, UL 83, and Federal Specification JC-30A with 600 volt insulation, be stranded (except for #10 AWG and smaller may be solid), and be minimum size #12 AWG (Except for control wiring and signal circuits).
1. Insulation: Provide THHN/THWN insulation for all conductors, except XHHW insulation may be used for conductors #4 and larger.
  2. Ampacity of conductors shall be rated for 75 degrees C regardless of temperature of conductor insulation when combining circuits in one conduit. Derate conductors and increase size per NEC when installing multiple circuits in a raceway, utilizing 75°C ampacity table.
  3. Connectors: Nylon shell insulated metallic screw-on connectors for #14-10 AWG, and bolted pressure or compression type lugs and connectors with insulating covers for #8 AWG and larger.
- F. Hangers and Supports.** All hangers, supports, fasteners and hardware shall be zinc-coated or of equivalent corrosion resistance by treatment or inherent property, and shall be manufactured products designed for the application. Products for outdoor use shall be hot dip galvanized.
1. Types: Hangers, straps, riser supports, clamps, U-channel, threaded rods, etc. as indicated and/or required.
  2. Seismic restraints and supports as indicated and/or required.
- G. Electrical Identification.**
1. Nameplates. Three-layer laminated plastic with minimum 3/16" high white engraved characters on black background, and punched for mechanical fastening. Fasteners: self-tapping stainless-steel screws or number 10-32 stainless steel machine screws with nuts and flat and lock washers. Each nameplate on all panelboards and switchgear shall indicate the following:
    - a. Panel Name
    - b. Voltage, Phase, Number of Wires
    - c. Source
  2. Underground Warning Tape: Six-inch wide polyethylene tape, permanently bright colored with continuous-printed legend indicating general type of underground line below and “CAUTION.” Colors as follows:
    - a. Red – Electric
    - b. Orange - Communications
  3. Marking Pens: Permanent, waterproof, quick drying black ink. Acceptable Manufacturers: Sanford Fine Point “Sharpie,” or equal.
  4. Wire Tags: Vinyl or vinyl-cloth self-adhesive wraparound type indicating appropriate circuit number, etc.
  5. Arc Flash Panelboard Stickers: Provide per NEC 110.16.

**H. Grounding.** Ground rods, conductors, clamps and connectors, etc as required;

1. Ground Rods: Minimum 3/4" diameter by 10' long copper clad steel.
2. Welded Connectors: Exothermic process.

**I. Firestopping Materials**

1. General: Firestop systems composed of firestop compounds and appropriate damming materials installed together with the penetrant (e.g., conduit) to form a complete firestop system, providing a fire resistant rating at least equal to the hourly fire resistance rating of the floor, wall or partition into which the firestop system is to be installed.
2. Test Standards: Firestopping materials shall be tested together as a system to the time/temperature requirements of ASTM E119 and shall be tested to UL 1479 (ASTM E814) and be UL classified for up to 3 hours.
3. Firestop Sealants: Non-hardening, conformable, intumescent putties, sealants or other compounds, containing no toxic solvents or asbestos, and exhibiting aggressive adhesion to all common building materials and penetrants, while allowing reasonable movement of the penetrants, without being displaced. Compounds shall be waterproof, non-toxic and smoke and gas tight.
4. Firestop Mortars: Light-weight, water-based, cementitious, fast drying, low density mortar, non-shrinking and non-cracking during its cure, and which forms a surface capable of being sanded, bored and painted.
5. Damming Materials: Mineral wool or ceramic fiber.
6. Multi-Cable Transits: Assemblies consisting of a frame, a compression mechanism, and grooved insert sealing modules sized for multiple penetrating elements of various sizes.
7. Acceptable Manufacturers: Hilti; Heavy Duty/Nelson; International Protective Coatings; Specified Technologies, Inc.

**J. Concrete Work**

1. Concrete shall be as follows;
  - a. Minimum Strength: 3000 psi @ 28 days
  - b. Aggregate: 3/4" aggregate
  - c. Cement: 588 #/cu. yd. minimum, type I or II
  - d. Slump: 4" maximum
  - e. Air: 5% - 7%
2. Reinforcing: Grade 60 bars, galvanized, sized as indicated, and 6" x 6" - W1.4 x W1.4 mesh, galvanized, and other reinforcing as indicated.
3. Forms: Wood, metal or other approved materials, constructed so as to withstand the forces of the newly placed concrete.
4. Equipment Pads: Minimum 4" thick indoor, 12" thick outdoor (with 9" below grade), with 1" x 45° chamfer on all top edges. For on grade installations provide 12" layer of crushed stone beneath pad. For pads to be placed on concrete floors, provide anchors into concrete floor. Comply with equipment manufacturer's specifications and/or utility company requirements.

**2.11 Engine Generator**

- A. General.** The station manufacturer will provide a generator and automatic transfer switch as shown on the contract documents of sufficient size to run the station background load. The generator set

will be shipped separately and pad mounted at the jobsite. The Contractor is required to install the required fuel tank (provided by Town) and fuel lines to connect to the factory mounted engine-generator set.

1. Approved manufacturer:

- a. Cummins-Onan Model C30 N6, 30kW, 240/120V, 1PH, 3W or approved equal.

**B. AC Generator.** The AC generator shall be synchronous, four pole, revolving field, drip proof construction, single pre-lubricated sealed bearing, air cooled by a direct drive centrifugal blower fan and directly connected to the engine with flexible drive disc(s). All insulation system components shall meet NEMA MG1 standard temperature limits for Class H insulation system. Actual temperature rise measured by resistance method at full load shall not exceed 150 degrees Centigrade.

A PMG excitation system shall use a separate power source from the main generator output. The automatic voltage regulator shall be temperature compensated, half wave phase controlled solid-state design and include an underspeed protection function. The regulator design shall include a torque-matching characteristic to allow the engine to use its fullest power producing capability at speeds lower than rated, to optimize motor starting capability and to provide the fastest possible recovery from transient speed dips.

The automatic voltage regulator shall be temperature compensated, solid-state design. The voltage regulator shall be equipped with three-phase RMS sensing. The regulator shall control buildup of AC generator voltage to provide a linear rise and limit overshoot. The regulator shall include an under frequency roll-off torque-matching characteristic, which shall reduce output voltage in proportion to frequency below a threshold of 58 Hz. The torque-matching characteristic shall include differential rate of frequency change compensation to use maximum available engine torque and provide optimal transient load response. Regulators which use a fixed volts per hertz characteristic are not acceptable.

The broad range generator shall be capable of delivering rated output (KVA) at a rated frequency and power factor at any voltage with the broad range.

**C. Engine-Generator Control.** The control shall have automatic remote start capability from a panel-mounted 3-position (Stop, Run, Remote) switch. Provide cycle cranking of 15 SEC (ON)/15 SEC (OFF) for three attempts (75 SEC). If engine fails to start, lockout the engine and indicate overcrank on alarm status panel.

The control shall shut down and lock out upon failing to start (over-crank), over-speed, low lubricating oil pressure, high engine temperature, or operation of a remote manual stop station. A panel mounted switch shall reset the engine monitor and test all the lamps. Lamp indications on the control panel shall include:

1. Over-crank shutdown – red
2. Over-speed shutdown – red
3. Low oil pressure shutdown – red
4. High engine temperature shutdown – red

5. High engine temperature pre-alarm – yellow
6. Low engine oil pressure pre-alarm – yellow
7. Low coolant temperature – yellow
8. Low fuel – yellow
9. Run – green
10. Not in automatic start - flashing red
11. Auxiliary (2) each - red (Customer identified).

The NEMA 1 enclosed control panel shall be mounted on the generator set with vibration isolators. A front panel illumination lamp with ON/OFF switch shall be provided. Control panel mounted indicating meters and devices shall include: Engine Oil Pressure Gauge, Coolant Temperature Gauge, DC Voltmeter, and Running Time Meter (hours).

**D. Engine.**

1. Fuel: Liquefied Petroleum Gas (Propane)
2. Rated Engine Speed: 1800RPM.
3. Lubrication System: The following items are mounted on engine or skid:
4. Lube Oil Pump: shall be positive displacement, mechanical, full pressure pump.
5. Filter and strainer: Provided by the engine manufacturer of record to provide adequate filtration for the prime mover to be used.
6. Crankcase drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.
7. Engine fuel system: The engine fuel system shall be installed in strict compliance to the engine manufacturer's instructions
8. Governor: Adjustable isochronous, with speed sensing.
9. Cooling system: Closed loop, liquid cooled. The generator set manufacturer shall provide prototype test data for the specific hardware proposed demonstrating that the machine will operate at rated standby load in an outdoor ambient condition of 40 deg C.
10. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer. Size of Radiator overflow tank: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
11. Expansion tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
12. Temperature control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.

**E. Base.** The engine-generator set shall be mounted on a heavy duty steel base to maintain alignment between components. The base shall incorporate a battery tray with battery hold down clamps within the rails. Provisions for stub up of electrical conduits shall be within the footprint of the set. Vibration isolators, standard quantity and type of the manufacturer, shall be integral between generator set and base.

**F. Auxiliary Equipment and Accessories.**



1. Generator Main Circuit Breaker: Set-mounted and wired, UL listed, molded case thermal-magnetic type, rated at 100 amps, 2 pole, 240 volts. Field circuit breakers shall not be acceptable for generator over-current protection.
2. Coolant Heater: Engine mounted, thermostatically controlled, water jacket heater(s) for each engine. The heater(s) shall be sized as recommended by the equipment supplier. Heater voltage shall be as required.
3. Starting and Control Batteries: Starting batteries, lead acid type, 12 or 24 volt DC, sized as battery cables and connectors.
4. Battery Charger: A 10 amp voltage regulated battery charger shall be provided for each engine-generator set. Input AC voltage and DC output voltage shall be as required. Chargers shall be equipped with float, taper and equalize charge settings. Operational monitors shall provide visual output along with individual form C contacts rated at 4 amps, 120 VAC, 30 VDC for remote indication of:
  - a. Loss of AC power - red light
  - b. Low battery voltage - red light
  - c. High battery voltage - red light
  - d. Power ON - green light (no relay contact)
5. Muffler: An exhaust muffler shall be provided for the engine, size and type as recommended by the generator set manufacturer. The mufflers shall be residential grade. Exhaust system shall be installed according to the generator set manufacturer's recommendations and applicable codes and standards.

**G. Housing.** Outdoor weather-protective Level 1 Quiet Enclosure housing shall be provided as factory-assembled to the generator set base and radiator cowling. Housing shall provide ample airflow for generator set operation. The housing shall have hinged side-access doors and rear control door. All doors shall be lockable. All sheet metal shall be primed for corrosion protection and finish painted with the manufacturer's standard color.

**H. Automatic Transfer Switch.** Complete factory assembled transfer equipment with electronic control designed for surge voltage isolation, voltage sensors on all phases of both sources, linear operator, permanently attached manual handles, positive mechanical and electrical interlocking and mechanically held contacts. Equipment rated 1000 amps and less shall include quick-make, quick-break contact mechanisms for manual transfer under load. All transfer switches and accessories shall be UL listed and labeled, tested per UL Standard 1008 and CSA Approved.

1. Ratings. Main contacts shall be rated for 600 Volts AC minimum.
  - a. Transfer switches shall be rated to carry 100 percent of rated current continuously in the enclosure. Circuit breaker type transfer switches do not meet this specification.
  - b. Transfer switches shall be continuously rated in ambient temperatures of -40 to +50 degrees C, relative humidity up to 95% (non-condensing) and altitudes up to 10,000 feet.
  - c. Transfer switch equipment shall have a withstand and closing rating (WCR) in RMS symmetrical amperes greater than the available fault currents shown on the contract documents.

2. Construction. Transfer switches shall be double-throw, electrically and mechanically interlocked, and mechanically held in both positions.
  - a. Transfer switches rated through 125 amperes shall be equipped with permanently attached manual operating handles and quick-break, quick-make over-center contact mechanisms suitable for safe manual operation under load. Transfer switches over 100 amperes shall be equipped with manual operators for service use only under de-energized conditions.
  - b. Main switch contacts shall be high-pressure silver alloy. Contact assemblies shall have arc chutes for positive arc extinguishment. Arc chutes shall have insulating covers to prevent interphase flashover.
  - c. Provide one set Form C auxiliary contacts on both sides, operated by transfer switch position, rated 10 amps 250 VAC.
  - d. Enclosures shall be UL listed. The enclosure shall provide NEC wire bend space. The cabinet door shall be key-locking. Controls on cabinet door shall be key-operated. Provide switch position indicator lamps and power available lamps for both sources (four total) on the outside cabinet door.
  - e. Transfer switches shall be mounted in enclosures as designated on the plans. Separate enclosures shall be the NEMA type specified. The cabinet shall provide required wire bend space at point of entry as shown on the plans. Manual operating handles and all control switches (other than key-operated switches) shall be accessible to authorized personnel only by opening the key-locking cabinet door. Transfer switches with manual operating handles and/or non key-operated control switches located on outside of cabinet do not meet this specification and are not acceptable.
3. Automatic Controls. Control shall be solid-state and designed for a high level of immunity to power line surges and transients, demonstrated by test to IEEE Standard 587-1980. The control shall have optically isolated logic inputs, high isolation transformers for AC inputs and relays on all outputs.
  - a. Solid state undervoltage sensors shall simultaneously monitor all phases of both sources. Pick-up and drop-out settings shall be adjustable. Voltage sensors shall allow for adjustment to sense partial loss of voltage on any phase. Voltage sensors shall have field calibration of actual supply voltage to nominal system voltage.
  - b. Automatic controls shall signal the engine-generator set to start upon signal from normal source sensors. Solid-state time delay start, adjustable from 0 to 5 seconds (factory set at 2 seconds) shall avoid nuisance start-ups. Battery voltage starting contacts shall be gold, dry type contacts factory wired to a field wiring terminal block.
  - c. The switch shall transfer when the emergency source reaches the set point voltage and frequency. Provide a solid-state time delay on transfer, adjustable from 0 to 120 seconds.
  - d. The switch shall retransfer the load to the normal source after a time delay retransfer, adjustable from 0 to 30 minutes. Retransfer time delay shall be immediately bypassed if the emergency power source fails.
  - e. Controls shall signal the engine-generator set to stop after a time delay, adjustable from 0 to 10 minutes, beginning on return to the normal source.

- f. Power for transfer operation shall be from the source to which the load is being transferred.
  - g. The control shall include latching diagnostic indicators to pinpoint the last successful step in the sequence of control functions, and to indicate the present status of the control functions in real time, as follows:
    - 1. Source 1 OK
    - 2. Start Gen Set
    - 3. Source 2 OK
    - 4. Transfer Timing
    - 5. Transfer Complete
    - 6. Retransfer Timing
    - 7. Retransfer Complete
    - 8. Timing for Stop
  - h. The control shall include provisions for remote transfer inhibit and area protection.
  - i. Transfer switches as designated on the contract documents shall be equipped with a field adjustable time delay during switching in both directions, during which time the load is isolated from both power sources, to allow load residual voltage to decay before closure to opposite source. The delay feature shall have an adjustable range of 0 to 7.5 seconds. Phase angle monitor is not acceptable. Transfer switches supplied without this delay shall have provisions to add it in the field without switch replacement.
4. Front Panel Devices. Provide devices mounted on cabinet front consisting of a key-operated selector switch to provide the following positions and functions:
- a. Test - Simulates normal power loss to control for testing of generator set. Controls shall provide for a test with or without load transfer.
  - b. Normal - Normal operating position.
  - c. Retransfer - Momentary position to override retransfer time delay and cause immediate return to normal source, if available.
- Transfer switch position and source available lamps.
5. Accessory Items. Transfer switches as shown on the plans shall be equipped with accessories as follows:
- a. Exerciser Clock: Provide solid state exerciser clock to set the day, time, and duration of generator set exercise/test period. Provide a with/without load selector switch for the exercise period.
  - b. Battery Charger: Provide a float charge battery charger rated 2 amps. DC output voltage shall be as required for the starting batteries. An ammeter shall display charging current. The battery charger shall have fused AC input and DC outputs.
6. Approved manufacturer:
- a. Onan Model OTECA-125, or approved equal.

## 2.12 Control Strategy

### A. General

- 1. The Contractor shall provide all labor, materials, equipment, and incidentals required to furnish and install a supervisory control and data acquisition (SCADA) system, complete and

operational with programmable logic controllers (PLCs), and networking cable and devices, control panel enclosures, software, programming, interconnecting cables, and all necessary accessories as shown on the Contract Drawings, as specified herein, or as required for complete operation.

2. All components of the SCADA System have been included under this Section so that the Owner will receive a completely coordinated and properly integrated system for efficiency, ease in operation, and correct functional relationship among all elements of the system. Therefore, all equipment specified under this Section shall be furnished by a single SCADA system supplier. This does not require that all equipment be manufactured by a single manufacturer, but does require that the SCADA system supplier be responsible for the satisfactory operation of the instrumentation and metering equipment and the SCADA system furnished hereunder. This does in no way relieve the Contractor for ultimate responsibility under this Contract for equipment, coordination, installation, operation, and guarantee.
3. It is the intent of this Contract that the installations be complete in all respects and ready for use and operation. The Contractor shall be responsible for all details, devices, accessories and special construction necessary to properly furnish, install, adjust, test and place in successful continuous operation, complete installations of this type.
4. The Contract Drawings are for purpose of guidance and to show functional features and required external connections. They do not necessarily show all components necessary to accomplish the desired results nor do they necessarily shown all components required to interface with the equipment. The Contractor shall provide all parts, equipment, wiring, control panels, and devices necessary to meet the functional requirements of the system.
5. The Contractor shall provide I/O wiring diagrams. Control loop drawings shall be incorporated in the I/O drawings. These drawings are to illustrate terminal block numbers of control panels, wire numbers, wire colors, and field terminations (terminal numbers) of all field devices including instruments and drives. These drawings shall be furnished in a timely fashion as required by the electrical contractor for conduit routing and wire pulling, labeling and terminations by the electrical contractor.
6. Contractor shall provide and install stainless steel tags engraved with instrument/devices labels I/O tags fastened to the field devices for the ease of identification in the field.
7. The Contract Drawings are intended to show the general arrangement of equipment including, but not limited to, instruments, piping, valves, pumps, drains, control panels, and supports. They are not intended to show exact dimensions. Connection piping may have to be modified in order to accommodate the actual equipment furnished. The cost of such modifications is considered as being in the bid price and, therefore, no payment will be made for such modifications.
8. Performance requirements: The SCADA system supplier shall furnish a SCADA system providing all necessary control functions for totally integrated operation from the booster pump station to the distribution system, including but not limited to the booster pump control panel, rechlorination station, and associated ancillary items. The SCADA system shall execute the following functions:

- a. Communicate analog level signal from the rechlorination station to the booster pump station.
  - b. Monitor and control operations via the PLCs.
  - c. Automatically record information pertaining to these operations.
  - d. Communicate between hardware components and field instrumentation.
  - e. Display all monitored values and alarms at the PLCs.
  - f. Display all monitored values, alarms, displays, trends, etc. on the PLCs.
  - g. Allow operators to input control set points via the PLCs.
  - h. Provide a UPS, ninety minutes worth of uninterruptible power supply to the PLCs. The stations will be on an emergency backup generator. In the event of a power failure, the system shall resume full control and functionality automatically when power is restored. This includes programming VFD's such that faults are cleared.
- B. Control Strategy.** The following control strategy describing the operations of each control loop indicated on the Drawings will be considered the essence of the specifications. Furnish and install all necessary equipment, instruments, software modules and appurtenances to achieve the performance as hereinafter described, even though such items may not be included in any specific listing of equipment to be furnished. An involved system of this nature requires emphasis on the functional aspects of the Specifications while the technical details serve to indicate the desired manner in which the end result will be accomplished. The following control strategies are associated with the facilities indicated below:
1. Booster Pumps (Booster Pump Station)
    - a. Field. The booster pumps shall be operated automatically based on the distribution system pressure measured in the hydropneumatic/rechlorination station. Each Pump will be controlled with a variable frequency drive (VFD). Each VFD shall be equipped with a Human Interface Module (HIM). The HIM shall be capable of an auto/manual mode and display the frequency of the well pump motor and other programming parameters. The VFD shall be networked to the SCADA PLC via a ControlNet communication port. A safety disconnect at the location of the booster pumps is to be equipped with an auxiliary contact that is hardwired to the VFD enable terminal (if the disconnect is opened, the drive is disabled).
    - b. SCADA. The Booster Pump PLC shall designate a Lead Pump, Lag No. 1, and standby for each 24-hour period on a rotating basis. The system shall activate the booster pumps based on the following set points (adjustable):
      - (1) Pump On: 165 psi (pressure within hydropneumatic/rechlorination station)
      - (2) Pump Off: 200 psi (pressure within hydropneumatic/rechlorination station)

\*The VFDs shall ramp the pumps up and down between these set points.

The Booster Pump PLC shall be capable of monitoring and displaying the status operation of each VFD and booster pump including the speed of each pump. If the lead pump fails, the Lag Pump No. 1 shall be activated. The booster pump PLC shall initiate an alarm and annunciate the appropriate condition upon pump failure. The Booster Pump Station PLC shall also display and record the run time for each pump.
  2. Booster Pump Station Pressure Transmitters

- a. Field. Two (2) pressure transmitters, installed on the suction and discharge side of the pump system within the Booster Pump Station shall continuously monitor pressure. The transmitter shall convert the pressure to a 4 – 20 mA signal, shall locally display the pressure in psi, and shall send a signal to the Booster Pump Station PLC (set points indicated above).
  - b. SCADA. The Booster Pump Station PLC shall accept the 4 – 20 mA signal, and display and record the instantaneous pressure in psi. In the event of a low pressure event on the suction side of the pumps the transmitter shall be interlocked with the pump operation and automatically shut down operation of the pumps. The minimum suction pressure set point shall be adjustable and be field set initially at 5 psi.
3. Booster Pump Station Water Flow
  - a. Field. A flow meter, installed on the 3-inch inlet line in the Booster Pump Station shall continuously monitor the water flow from the Clinton Correctional Facility water system. The transmitter shall convert the raw water flow to a 4 – 20 mA signal, shall locally display the instantaneous flow rate in gpm and the total daily flow in gallons, and shall send a signal to the Booster Pump Station PLC.
  - b. SCADA. The Booster Pump Station PLC shall accept the 4 – 20 mA signal, and display and record the instantaneous water flow rate in gpm and the total daily water flow in gallons.
4. Hydropneumatic/Rechlorination Station Pressure Transmitter
  - a. Field. A pressure transmitter, installed on the upstream side of the pressure reducing valve within the hydropneumatic/chlorination station shall continuously monitor the pressure entering the station. The transmitter shall convert the pressure to a 4 – 20 mA signal, shall locally display the pressure in psi, and shall send a signal to the Hydropneumatic/Rechlorination PLC (set points indicated above).
  - b. SCADA. The Hydropneumatic/Rechlorination PLC shall accept the 4 – 20 mA signal, and display and record the instantaneous pressure in psi. The hydropneumatic/rechlorination station pressure shall be utilized by the Booster Pump PLC to modulate the speed of the booster pump VFDs.
5. Hydropneumatic/Rechlorination Station Water Flow
  - a. Field. A flow meter, installed on the inlet line in the Hydropneumatic/Rechlorination Station shall continuously monitor the water flow from the booster pump station. The transmitter shall convert the raw water flow to a 4 – 20 mA signal, shall locally display the instantaneous flow rate in gpm and the total daily flow in gallons, and shall send a signal to the Hydropneumatic/Rechlorination Station PLC.
  - b. SCADA. The Hydropneumatic/Rechlorination Station PLC shall accept the 4 – 20 mA signal, and display and record the instantaneous water flow rate in gpm and the total daily water flow in gallons. The flow rate shall be utilized by the Hydropneumatic/Rechlorination Station PLC to modulate the chemical feed pumps.
6. Sodium Hypochlorite (NaOCl) Feed Pump
  - a. Field. The NaOCl feed pump shall deliver sodium hypochlorite to the finished water prior to discharge to the distribution system. They shall be operated automatically based on the

water chlorine residual reading and the water flow rate to maintain a dosage of 2 mg/L (adjustable) entering the distribution system. Each sodium hypochlorite feed pump shall be equipped with a local microprocessor controller with keypad and operation indication. The controller shall accept a 4 – 20 mA analog speed reference signal and provide a 4 – 20 mA analog speed feedback signal for closed loop operation. The controller shall provide a dry relay contact for alarming low fluid level from a two-stage flow switch installed in the Day Tank.

- b. SCADA. The Hydropneumatic/Rechlorination Station PLC shall provide a Start/Stop signal, a 4 – 20 mA speed reference signal and accept a 4 – 20 mA speed feedback signal. The hydropneumatic/rechlorination PLC shall indicate pump operation status and speed for each feed pump. Hydropneumatic/Rechlorination Station PLC shall initiate an alarm upon feed pump failure.
7. Sodium Hypochlorite (NaOCl) Day Tank Level
- a. Field. A two-stage float switch shall be installed to continuously monitor the sodium hypochlorite day tank level. The float switch shall be connected directly to the sodium hypochlorite feed pump controllers. The sodium hypochlorite feed pump controllers shall have an alarm contact for low level annunciation to the Hydropneumatic/Rechlorination Station PLC.
  - b. SCADA. The Hydropneumatic/Rechlorination Station PLC shall receive the 24VDC discrete alarm signal from sodium hypochlorite feed pumps and shall initiate a warning signal for a low tank level of 1.6 inches (adjustable) above the finished floor of the Chemical Feed Room and a pump shutdown signal for a tank level of 0.86 inches above the finished floor.
8. Water Chlorine Residual
- a. Field. A chlorine residual analyzer, located in the Hydropneumatic/Rechlorination Station shall continuously monitor the water chlorine residual. The transmitter shall convert the water chlorine residual to a 4 – 20 mA signal, shall locally display the finished water chlorine residual in mg/L, and shall send a signal to the Hydropneumatic/Rechlorination PLC.
  - b. SCADA. The Hydropneumatic/Rechlorination Station PLC shall accept the 4 – 20 mA signal, and display and record the instantaneous water chlorine residual in mg/l of free chlorine. The water chlorine residual shall be utilized by the Hydropneumatic/Rechlorination Station PLC to modulate the chemical feed pumps. The Hydropneumatic/Rechlorination Station PLC shall initiate an alarm upon a high water chlorine residual of 2.0 mg/L (adjustable) or a low water chlorine residual of 0.2 mg/L (adjustable).
9. Booster Pump and Hydropneumatic/Rechlorination Station Generators
- a. Field. An automatic transfer switch shall be installed at each of the stations to accommodate the utility loads. Utility power failure, transfer switch connected to utility, transfer switch connected to generator, generator failure, and generator run status shall be inputs to each of the PLCs.
  - b. SCADA. The PLCs shall accept and display each of the above-described status and alarm conditions. When the PLCs receive indication of a utility power failure, it shall wait until generator run status and transfer switch connected to generator status is received, then after

a 15 second time delay (adjustable) shall restore the run status that preceded the utility power failure.

**C. Warranty**

1. Equipment furnished under this Section shall be guaranteed to be free of defects in workmanship, design, and material. The Contractor shall replace, without cost to Owner, any equipment or part that is defective or shows undue wear, within one (1) year after the equipment has been placed into continuous, permanent operation.
2. The Contractor shall include the services of a factory-trained representative to provide repair service for the equipment under this Section for a period of one (1) year from date that the equipment is placed into continuous, permanent operation. The cost of all replacement parts required during this one (1) year period shall be included.
3. The Contractor shall pay all royalty or license fees for use of patented devices or systems and shall protect the Owner from patent infringement litigation thereon

**D. Spare Parts**

1. Contractor shall furnish the following spare parts and equipment and store as directed:
  - a. One of each type of plug-in, process I/O board for PLC.
  - b. Two (2) 16 gig jump drives

**E. Source Quality Control**

1. Prior to shipment of the SCADA system, factory test all elements of the system, both hardware and software, to demonstrate that the total system satisfies all of the requirements of this Section.
2. Furnish all special testing materials and equipment. Where it is not practical to test with real process variables, provide suitable means of simulation. These simulation techniques shall be subject to the approval of the Engineer.
3. Testing shall not be considered complete until all tests and test documentation has been completed, reviewed, and approved by the Engineer. Tests shall generally conform to the applicable sections of ISA-RP55.1. Demonstrate that all equipment conforms to these Specifications by submitting test results for similar units.
4. Coordinate all of the testing with all other associated suppliers and with the Owner, as specified. Notify the Engineer at least four weeks prior to start of testing.
5. As a minimum, test the system at the factory with simulated inputs and outputs. Exercise all components and test all functions over their entire range. During the test, operate the system long enough to demonstrate that it is capable of continuous operation.
6. Submit a PDF copy of the results of the factory tests to the Engineer.
7. In the event that the conditions specified are not met or if the test is deemed unsatisfactory for other reasons, correct the fault and retest the entire system until the tests are satisfactory to the Owner all at no additional cost to the Owner.



8. The Owner may elect to have up to three of his authorized representatives present to witness the tests. The Owner's authorized representatives will have access to all parts of the equipment, apparatus, and test instruments and will have the right to check any or all readings, calibrations, or any factor necessary to determine whether or not the performances are in accordance with the Specifications.
9. The Owner reserves the right to waive the presence of any or all of his representatives at any or all witness tests. This right of waiver does not release the manufacturer from performing the required test.

## 2.13 Controls

- A. General.** Provide one (1) complete Programmable Logic Controller (P.L.C.) based control system as described herein. The system shall employ industry standard Programmable Logic Controllers as described herein. The system shall be completely factory integrated and tested in the factory and field run-in with factory personnel.
- B. Design.** This equipment specification and related documents represent a design based on the Allen-Bradley 1400 Series Programmable Logic Controllers. Communications, interface, input/output and other peripheral devices have been proven to be 100% compatible with the Allen-Bradley equipment. No other PLC equipment is acceptable unless the Engineer-of-Record provides notification of alternate system approval by addendum prior to the bid date
- C. System Responsibility.** The station manufacturer shall be the System Integrator and as such will assume full and complete responsibility for the Station P.L.C. Control System and related control functions and the telemetric communication for the full scope of supply.

This assumption of full responsibility shall include identifying all electrical, mechanical and plumbing schematics and wiring inter-connect diagrams, providing instrument installation details, preparing input/output listings, writing software, performing software and hardware integration, installation in the station at the factory, debugging, calibrating and tuning the various components and subsystems and providing training and warranty services.

- D. U.L. Listing.** The system integrator shall produce panels that fully comply with Underwriters Laboratory Standard for Industrial Control Panels #508A. All panels shall be UL 508A listed. The UL 508A "sticker" shall be clearly displayed in the appropriate location within the panel. The UL 508A listing shall be in the name of the equipment manufacturer.
- E. System Integrator.** The station manufacturer shall have on staff no fewer than four (4) full time Control System Engineers who are dedicated to the development of P.L.C. programs, SCADA software, Instrumentation configuration and control logic development. The system integrator shall have no fewer than three (3) electrical engineers on staff dedicated to the development of panel wiring diagrams, panel layouts and general electrical design.

The system Integrator shall have a field service department with no less than five (5) fully equipped, trained and competent field service technicians able to work on any and all devices provided with this system. The system integrator shall have been in the business of providing telemetry, control

and SCADA systems to the water production and water distribution market for no less than 10 years.

The System Integrator shall submit a list of all personnel with title, job function, years with the company, years in this field and educational achievements with the submittal. Companies that do not meet the above requirements will not be approved.

- F. Design, Assembly and Test.** The PLC panel design, assembly, the integration of component parts and startup will be the responsibility of the manufacturer of record for the factory-built water distribution equipment. That manufacturer shall maintain at its regular place of business a complete PLC design, assembly and test facility to assure continuity of control design with equipment application.
- G. Enclosures.** Enclosures shall be NEMA 1 for indoor and NEMA 4 for outdoor locations. Enclosure shall be fabricated from a minimum of 14-gauge cold rolled steel with a baked enamel finish in the manufacturer's standard color. Units shall include a single gasket front door. Hinges, locking hasp and door clamping hardware shall be included.
- H. Power Requirements and UPS.** Controls shall operate from a source of 120 volts, 1 phase, 60 Hz. Each panel shall be accompanied with an uninterruptible power supply (UPS). The UPS shall condition the power as well as provide 500 VA of power during outages. A 6-amp control power circuit breaker shall be employed as both a method of equipment protection and as a means of power disconnection. The circuit breaker shall be a single pole, thermal, magnetic type with a 10,000 Amp Interrupt Current rating. The circuit breaker shall be UL listed.
- I. Power Supplies.** All DC power supplies required for operation shall be provided. Units shall provide sufficient voltage regulation and ripple control to assure powered components can operate within their required tolerances.
- J. Transient Voltage Surge Suppression (TVSS).** The system manufacturer shall provide transient voltage and surge suppression for all PLC data communication devices whenever the communications cable is located outside the building in which the panel resides. This also applies to all outdoor panels with communications cables exiting the PLC panel enclosure. The TVSS unit shall be UL 497B listed. The TVSS unit shall have a maximum DC operating voltage of 9.6 VDC, a clamping voltage of 81V, and an 8 x 20 US surge current rating of 1000 amps. The unit shall be approved for use by Allen-Bradley Company on the Allen-Bradley Data Highway communications products.

Transient voltage and surge suppression shall also be provided for 10-32 VDC instrumentation signal systems. The TVSS units shall be employed when the signal cable extends beyond the boundaries of the building in which the PLC panel is located. The TVSS unit shall be UL 497B listed. The TVSS unit shall have a maximum operating voltage of 32 VDC, a clamping voltage of 100V, and an 8 x 20 US surge current capability of 1000 amps.

TVSS units must be as manufactured by Leviton, Inc., of Little Neck, New York, Model 3803-485/DHP for PLC communications and Model 3420-009/035 for 10-32 VDC signal wiring, without exception.

- K. Wiring Requirements.** All wiring shall be in complete conformance with the National Electrical Code, state, local and NEMA electrical standards. All incoming and outgoing wires shall be connected to numbered terminal blocks and all wiring neatly tied and fastened to chassis as required.
- L. Network Data Line Surge Suppressors.** Provide transient surge suppressors for all leased telephone line, and Ethernet connections that are included as a part of this system. Unit shall have connection capabilities for RJ45, 100 BASE-T, 10 BASE-T, Token Ring, and RS-422 connections. The unit shall have a nominal clamping voltage of 7.5 volts and a Peak Pulse Current rating of 750 amperes. Unit shall be as manufactured by Tripp Lite, Inc., Model DNET-1.
- M. Telephone Line Surge Suppressors.** Provide the following for all dial-up connected to data modems or automated alarm dialing equipment that are included as a part of this system. Unit shall have connection capabilities for RJ11 or RJ45. The unit shall have a nominal clamping voltage of 260 volts and a Peak Pulse Current rating of 1020 amperes. Unit(s) shall be as manufactured by Tripp Lite, Inc., Model DTEL2.
- N. Programmable Logic Controller (PLC).** Provide microprocessor-based Programmable Logic Controllers (PLC) as detailed in this specification and on the applicable plan sheets. The PLC shall be capable of use in a stand-alone configuration and also be capable of being networked into a larger system. It shall be specifically suitable for use in a telemetry system as an intelligent remote telemetry unit. The PLC shall be programmable in standard ladder logic.

The PLC shall have a processor and thirty-two (32) embedded discrete I/O. The I/O shall be expandable with the use of expansion I/O. The expansion I/O shall not require a "rack" in which to be mounted.

The program shall be stored on non-volatile Electrically Erasable Programmable Read Only Memory (EEPROM) modules. The CPU shall have 10,000 bytes (10K) user memory and perform 32 bit signed math functions. The CPU shall have integral to it, two communications ports capable of RS-232 DF-1 half, and full duplex serial communications as well as MODBUS RTU Slave protocol, and DF-1 radio modem. The CPU also shall have a third port integral to it a communications port capable Ethernet communications. The CPU shall have on-line programming feature without interrupting the program running at the time.

1. The PLC shall be powered from 85/265 VAC 60 Hz line power.
2. The PLC shall be U.L. listed, C-U.L. listed, CE compliant and suitable for use in Class 1, Division 2, Groups A, B, C and D environments.
3. The PLC shall be equipped with the following embedded discrete I/O:
  - a. 20 - 120 VAC inputs
  - b. 12 - relay outputs.
4. The CPU shall have a LCD display integral to the unit for display of status and selectable information.
5. The PLC shall have expansion I/O capabilities as follows: Discrete input modules shall be available in 8 channel configurations. The modules shall accept 20-48 VDC, 100-240 VAC signals. Modules shall have a removable terminal strip.

6. Relay Output Modules: Relay output modules shall be available in 8 channel versions. Modules shall be rated for 5-265 VAC and 5-125 VDC voltages.
7. Analog Input / Output Module: Analog input modules shall be available in 4 channel configurations, 2 inputs and 2 outputs. The modules shall be rated for input signals between 4 mA and 20 mA., or 0 – 10 VDC. The module shall employ a 12 bit analog to digital conversion chip. Outputs shall be either 0-10 VDC or 0-20 mA DC. The output digital to analog converter shall have 12 bit resolution. .

**O. Operator Interface Equipment.** The PLC control system shall include a 7” High-Definition front panel mounted touch screen display for operator interface. The display shall have a 6.1" X 3.4” screen with 800 x 480 pixel resolution using 65K-color TFT LCD. The screen shall have no touch cells and utilize analog resistive technology. Unit shall have 64mb of operating RAM, 128mb flash, and a high-speed 400MHz processor. Unit shall have a real time clock chip as a standard option. Operator interface shall have integrated Ethernet port and shall support the Allen-Bradley Ethernet/IP protocol.

The color touch screen operator interface shall be manufactured by Maple Systems Inc., Everett, WA 98204, Model #HMI5070th, Silver Series. All required communication modules, cables, and accessories shall be provided for a complete and operational system.

**P. Programming Software.** All PLC equipment supplied on this project shall be programmable in standard ladder logic. The ladder logic development and configuration software shall be the same for all PLC's listed in this specification. Equipment requiring separate program development and configuration software for each product is not acceptable. The software program shall be Windows based and be Microsoft certified for use with Windows 7. The software shall be able to develop the ladder logic programs, provide equipment configurations, diagnostics for both equipment and software, upload programs, download programs, and edit programs "on-line" where applicable.

1. Approved manufacturer:
  - a. Rockwell Software, a division of Rockwell Automation, Model RS-LOGIX, or approved equal.

**Q. Ethernet Switch.** Ethernet switch to have 5 TP RJ45 ports minimum. Switch shall be an unmanaged switch with auto negotiation, in compliance with IEEE 802.3, store and forward switching mode.

1. Approved manufacturer:
  - a. Phoenix Contact p/n 2891152, or approved equal.

**R. Media Converter.** Single Mode Fiber optic to Cat 6 Ethernet Media Converter. Unmanaged operation, DIN Rail mounted, RJ-45 Port Support Full/half Duplex operation, EDS Protection Diodes on RJ-45 port, Surge Protection Diodes on Power Inputs, in compliance with IEEE 802.3.

1. Approved manufacturer:
  - a. N-Tron 102MC, or approved equal.

**S. Fiber Optic Patch Panel.** Wall mounted Enclosure housing one CCH connector for single mode operation, 12F, (OS2).

1. Approved manufacturer:
  - a. Corning Single-Panel Housing (SPH) with Corning Connector CCH series, or approved equal.

**T. Auto-Dialer.** Wall mounted, 120VAC with battery backup, 8 Zones, N.O./N.C contacts, or thermistor. Capable of 8 different messages and dialing up to 8 different telephone numbers. Metal Oxide Varistor and self-resetting fuse phone line protection.

1. Approved manufacturer:
  - a. Sensaphone Model 800, or approved equal.

**U. Operator Description for PLC.** There shall be control algorithms programmed into the Programmable Logic Controller to operate the system based on an operator adjustable chlorine residual level through local setting.

The system shall control chemical pump starting and stopping, the cascading of pumps and pump speed based upon station flow and residual levels. The PLC shall be programmed by personnel who are an employee of the station manufacture to insure a single source of responsibility and maintenance.

The PLC system shall operate automatically to adjust the output of the selected chemical pump in order to maintain an adjustable residual level setpoint for the operation of the station. Pump output shall be adjusted by varying the speed at which it operates. The calculation of needed pump speed shall be performed by a programmable logic controller (PLC) which shall have input to it a signal directly proportional to the rate of flow and residual level of the station.

The PLC shall employ a standard Proportional Integral and Derivative algorithm to calculate the 4-20mA speed reference output to maintain the station setpoint.

**V. Major Equipment at Hydropneumatic/Re-chlorination Station.**

1. Allen-Bradley MicroLogix 1400 PLC
2. NEMA enclosure
3. Pressure transmitters (2)
4. Complete configuration & programming
5. Operator Interface Unit
6. Other devices as needed to provide a complete and operable installation.

**2.14 Foundation** The foundation and concrete pad, including splash and propane tank pads, shall be designed and furnished by the Contractor. The design shall be submitted for review as part of the station submittal package.

1. Submittals shall be stamped by a licensed Professional, Registered in the state of New York.
2. Buoyancy calculations shall be included as part of this submittal.

3. The Contractor shall design conventional shallow foundations, bear a minimum of 5' below finished grade, based on a minimum soil bearing pressure of 3,000lbs/ft<sup>2</sup> in accordance with the March 2016, CHA Geotechnical Engineering Report. Additional geotechnical subsurface investigations may be performed at the Contractor's expense, which may yield a higher soil bearing capacity. If performed, a copy of the Geotechnical Evaluation shall be submitted along with the foundation design.
4. The Contractor shall provide the necessary connection system for installation of the packaged booster pumping station to the foundation, based on recommendations from the station manufacturer.
5. The design of the concrete foundation, the specifications for the cement and aggregate, and the mixing of the aggregate shall be in accordance with the latest version of Standard 318 of the American Concrete Institute (ACI). The concrete shall develop a minimum compression strength of 4,000 psi at 28 days.

**2.15 Spare Parts.** Provide one set of spare lights, fuses, and breakers.

### **3 CONSTRUCTION**

**3.01 General.** Equipment installation shall be in complete conformance to manufacturer's instructions.

**3.02 Shipment and Delivery.** The station manufacturer will be required to deliver the station complete and undamaged by the manufacturer's carrier to the site fully assembled and ready for the power, telephone and fiber optic communication, and inlet and outlet piping and floor drain connections to be completed on site.

The station manufacturer shall provide the spreader bars, and any on site station rigging, from the spreader bars to the station base required for off-loading and placement of the station in the final position on the Contractor installed concrete foundation at the site.

**3.03 Site Preparation and Execution.** Excavation of the booster pumping station shall be in accordance with Section 206 *Trench, Culvert, and Structure Excavation*. Compaction of each layer shall be in accordance with §203-3.03C. *Compaction*. Backfill material at structures shall be in accordance with §203-1.01H *Suitable material*.

**3.04 Access.** The Contractor must provide a level unobstructed area large enough for crane and tractor-trailer to park adjacent to the station foundation. Crane must be able to place outriggers within 5'-0" of edge of foundation and truck and crane must be able to get side by side under their own power.

**3.05 Pipeline Connections.** Install as specified by the station manufacturer and as shown on the Drawings.

**3.06 Floor Drains.** Floor drains shall drain to daylight using a slope of 1/4" per foot and be fitted with a stainless steel screen at the pipe discharge as shown on the Drawings.

#### **3.07 Electrical Service, Telephone and Fiber Optic Connections**

**A. General.** The installation of all electrical work, and telephone and fiber optic connections shall be in accordance with the intent of the Contract Documents, as determined by the Engineer.

All materials and equipment shall be installed as recommended by the respective manufacturers, by mechanics experienced and skilled in their particular trade, in a neat and workmanlike manner, in accordance with the standards of the trade, and so as not to void any warranty or UL listing.

All electrical work shall be performed under the Contractor's direct supervision, using sufficient and qualified personnel as necessary to complete the work in accordance with the progress schedule. The Contractor shall assign one or more competent supervisors who shall have authority to accept and execute orders and instructions, and who shall cooperate with the other Contractors and subcontractors, the Engineer and Owner in all matters to resolve conflicts and avoid delays.

- B. Fiber Optic Cable.** The fiber optic cable shall be furnished under a separate item. The work required to install the cable from the riser pole into the station for service connection shall be included under this item.
- C. Conditions Verification.** Examine the areas and conditions under which the work is to be performed, and identify any conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.
- D. Coordination.** Sequence, coordinate and integrate the installation of all electrical materials and equipment for efficient flow of work, in conjunction with the other trades. Review the Drawings for work of the other trades, and report and resolve any discovered discrepancies, prior to commencing work.
1. Cooperation. Cooperate with the other Contractors and individual disciplines for placement, anchorage and accomplishment of the work. Resolve interferences between work of other disciplines or Contractors, prior to commencing installation.
  2. Chases, Slots, and Openings. Arrange for chases, slots, and openings during the progress of construction, as required to allow for installation of the electrical work.
  3. Supports and Sleeves. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
  4. Obstacles and Interference. When installing equipment and raceways, provide offsets, fittings, accessories and changes in elevation or location as necessary to avoid obstacles and interferences, per actual field conditions.
  5. Space Requirements. Electrical equipment sizes indicated on drawings are generally based on specified manufacturer. Verify that the proposed equipment will fit in the space indicated on the drawings. Maintain clearances required by NEC.
- E. Dimensions.**
1. Building Dimensions. For exact locations of building elements, refer to dimensioned drawings. However, field measurements take precedence over dimensioned drawings.
  2. Site Dimensions. Field measurements take precedence over scaled electrical site plans.
  3. Establish the exact location of electrical equipment based on the actual field verified dimensions of equipment furnished.

**F. Electrical Installation.**

1. Unfinished and Finished Areas. For the purposes of these electrical specifications, “unfinished” areas shall include mechanical, electrical and telephone equipment rooms. All other areas shall be considered “finished” spaces, unless indicated or approved otherwise.
2. In Unfinished Areas: Raceways, equipment and devices may be installed concealed or exposed, unless indicated otherwise.
3. In Finished Areas: Conceal all raceway and flush mount all electrical boxes, equipment, and devices unless indicated or approved otherwise. The space above suspended ceilings or behind furred spaces is considered outside finished areas and electrical materials installed within these areas are considered concealed.
4. Minimum Mounting Height. Install exposed raceway and all other electrical equipment (e.g., lighting fixtures) with not less than 7'-6" clear to finished floor, unless indicated or approved otherwise, and excluding raceway and equipment mounted on walls.
5. Dimensions and Clearances. Field measure all dimensions and clearances affecting the installation of electrical work, in relation to established datum, building openings and clearances, and work of other trades, as construction progresses.
6. Rough-In Locations. Verify final locations for rough-ins with field measurements and requirements of actual equipment being installed.
7. Door Swings. Verify the swings of all doors before switch outlets or other electrical devices are installed. If necessary, relocate devices so they are not obstructed by doors when doors are open.
8. Ceiling Mounted Devices. The locations indicated on the architectural reflected ceiling plans take precedence over the electrical documents, in the event of conflict.
9. Install equipment, conduit, cable tray, hangers, and supports to withstand seismic forces for the seismic zone of the installation.

**G. Layout**

1. General. Install electrical systems, materials and equipment level and plumb, and parallel and perpendicular to other building systems and components, where installed exposed.
2. Serviceability. Install electrical equipment and raceways, etc. to readily facilitate servicing, maintenance and repair or replacement of components, and so as to minimize interference with other equipment and installations.
3. Clearances. Prior to commencing work, verify that all electrical equipment will adequately fit and conform to the indicated and code required clearances, in the spaces indicated on the Drawings. If rearrangement is required, submit plan and elevation drawings or sketches indicating proposed rearrangement, for the Engineer’s approval. Do not rearrange without express written permission of the Engineer.

**H. Holes, Sleeves, and Openings.**

1. General. Provide all holes, sleeves, and openings required for the completion of the work and restore all surfaces damaged, to match surrounding surfaces. Maintain integrity of all fire and smoke rated barriers using approved firestopping systems. When cutting holes or openings, or installing sleeves, do not cut, damage or disturb structural elements or reinforcing steel, unless approved, in writing, by the Engineer.
2. Conduit Penetrations. Size core drilled holes so that an annular space of not less than 1/4" and not more than 1" is left around the conduit. When openings are cut in lieu of core drilled, provide sleeve in rough opening. Size sleeves to provide an annular space of not less than



1/4" and not more than 1" around the conduit. Patch around sleeve to match surrounding surfaces.

#### **I. Firestopping Systems.**

1. General. Install firestopping at all electrical raceway and cable penetrations through floor structures and interior walls or partitions which are time-rated fire and/or smoke barriers.
2. Preparation. Prior to installation, verify that all penetrating elements and supporting devices are permanently installed and that surfaces which will be in contact with penetration seal materials are clean and free of dust, dirt, grease, oil, loose materials, rust or other substances.
3. Installation. Install firestop systems in accordance with UL approved design details and the manufacturer's instructions. Install sleeves, conduits and cables with required clearance spaces, allowing installation of sealing materials. Do not exceed the outside diameter of the sleeve, conduit or cable by more than one inch or by less than 1/4" when making openings for penetrations. Install firestop systems so as to completely seal openings to prevent passage of smoke and water.

#### **J. Underground Work.**

1. General. Perform all excavating, trenching and backfilling, etc. as indicated or required for the installation of all underground electrical work. Coordinate work with other trades and verify existing underground services and conditions.
2. Conduit Burial Depth. 30" below finished grade. All excavation and burial depths indicated are below finished grade.
3. Excavating. Do not excavate below required depth, except as necessary for removal of unstable soil or when rock is encountered. When rock is encountered, excavate six inches below the required depth and backfill with a minimum 6" layer of crushed stone or gravel between rock bearing surface and the electrical installation. Stockpile satisfactory excavated materials where directed, until required for backfilling. Remove and legally dispose of excess excavated materials and materials not suitable for backfill use. Shore and brace as required for stability of excavation. Remove shoring and bracing when no longer required. Where sheeting is allowed to remain, cut top of sheeting off at an elevation of 30" below finished grade.
4. Protection. Protect structures, utilities, sidewalks, pavements and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by excavations.
5. Existing Utilities. Remove existing electrical and other utility lines so indicated. Where existing utilities which are to remain exist within areas of excavation, locate such utilities and support and protect during excavation operations.
6. Trenching. Cut all trenches neatly and uniformly and so as to provide ample working room and at least six inches clearance on both sides of raceways, etc., unless otherwise noted. Take necessary precautions when working near existing underground utilities, and coordinate with the installation of concurrent utilities by other trades. Unless indicated otherwise, pitch all electrical conduit runs downward away from buildings, manholes, and pad mounted equipment. Excavate trenches to depth indicated or required. Limit length of open trench to that in which installations can be made and trenches backfilled within the same day.
7. Sand Envelope. Install a minimum envelope of three inches (top, bottom, and sides: three inches each) of fine grain sand around all electrical cables and conduits installed below grade unless indicated otherwise.

8. Preparation for Backfilling. Backfill excavations as promptly as work permits, but not until completion of inspection, testing, approvals, and recording of underground utility locations. Prior to backfilling, remove all concrete form work, shoring, bracing, trash and debris.
9. Backfilling. Use only approved materials free from boulders, sharp objects and other unsuitable materials. Match the final elevations and materials of areas affected by electrical excavating, trenching and backfilling. Replace conduit and cables damaged by improper backfilling. Replace surface materials to match existing surface materials if no other utility or site work is being done in area. Place specified soil materials in 4" - 8" layers to required subgrade elevations, for area classifications as follows:
  - a. Under Building Slabs: Use drainage fill materials.
  - b. Under Piping and Equipment: Use subbase materials where required over rock bearing surfaces and for correction of unauthorized excavation.
  - c. For Raceways Less below Surface of Paved Areas, Driveways, or Roadways: Provide 4" thick concrete base slab support. After raceway installation, provide 4" thick concrete encasement (sides and top) prior to backfilling and placement of roadway subbase. Refer to contract Drawings for Details.
10. Backfill Placement. Place backfill and fill materials in layers of not more than 8" in loose depth for material compacted by heavy equipment, and not more than 4" in loose depth for material compacted by hand-operated tampers. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification specified below. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice. Place backfill and fill materials evenly adjacent to structures, piping, and equipment to required elevations. Prevent displacement of raceways and equipment by carrying material uniformly around them to approximately same elevation in each lift.
11. Compaction. Compaction shall be in accordance with the Section 203-3.03C *Compaction*.
12. Detectable Warning Tap. Install detectable warning tape 18" below grade.

#### **K. Raceway Systems.**

1. Raceway Types. Unless indicated otherwise, use raceway types as follows:
  - a. Indoors, Concealed in Walls or Above Ceilings: EMT.
  - b. Indoors, Exposed: Use rigid galvanized steel conduit below ten feet above finished floor. EMT may be used above ten feet.
  - c. Indoors, Below Floor Slab: (Minimum 3/4 inch size). Schedule 80 rigid non-metallic conduit. Stub up using rigid galvanized steel elbows.
  - d. Outdoors, Below Grade: (Minimum 1-inch size). Schedule 80 rigid non-metallic conduit. Stub up using rigid galvanized steel elbows. Schedule 40 rigid non-metallic conduit.
  - e. Outdoors, Exposed: Rigid galvanized steel conduit.
  - f. Flexible Steel Conduit: Use (in dry locations only) for connections to transformers, vibrating equipment, and equipment requiring minor adjustments in positions, for final connections to recessed lighting fixtures, and between outlet boxes in metal stud partitions.
  - g. Liquid-Tight Flexible Steel Conduit: Use where flexible steel conduit connections are required in damp, wet or oily locations, and for final connections to all motors and similar equipment.

2. Raceway Routing. As required by job conditions unless specific routes or dimensioned positions are indicated on the drawings. Install tight to slabs, beams and joists wherever possible. Route exposed conduit, and conduit installed above ceilings, parallel or perpendicular to walls ceilings and structural members. Install to maintain minimum headroom and to present a neat appearance. Run parallel raceways together with bends made from same center line. Verify exact locations of all raceways, pull boxes, and junction boxes. Resolve any conflicts before installation.
3. Raceway Installation. Cut conduit ends square using saw or pipecutter and ream each cut end smooth. Carefully make all conduit bends and offsets so that the inside diameter of pipe is not reduced. Make bends so that legs are in the same plane. Make offsets so that legs are in the same plane and parallel. Protect stub-ups from damage, and carefully rebend when necessary.
4. Fittings. Make up all raceway fittings tight so that final installation of raceway, fittings and enclosures constitutes a firm mechanical assembly and a continuous electrical conductor. Where required, provide bonding jumpers to assure electrical continuity.
5. Protection. Protect all raceways, enclosures and equipment during construction to prevent entry of concrete, debris and other foreign matter. Free clogged conduits of all obstructions, or replace, prior to pulling wire. Do not pull wire within buildings until buildings are completely enclosed.
6. Boxes. Install all outlet, pull and junction boxes rigidly, plumb and level. Support and secure boxes independently from conduits terminating at box. Install all boxes so as to be accessible and so that covers may be easily removed.
7. Handholes. Provide as indicated, installed plumb and level. Where not indicated, install every 200' at a minimum.
8. Conduit Seals. Install conduit seal for each conduit penetrating an exterior building wall below grade (unless penetration is below lowest building floor slab), and elsewhere as indicated, and so as to achieve a sealed watertight installation.
9. Pull Strings. Provide pull strings in all spare conduits.

#### **L. Concrete Work**

1. General. All concrete shall be prepared from approved materials and poured on clean, stable surfaces.
2. Exterior Base Surfaces. Twelve-inch layer of crushed stone over well consolidated, stable, undisturbed soil. Where the underlying soil contains excess organic material, trash or voids, or fails to provide solid bearing for any other reason, excavate to the depth required for solid bearing and re-establish the required elevation with approved granular materials.
3. Finishing. Trowel all exposed surfaces smooth. Round-off or chamfer all exposed edges.
4. Curing. Beginning immediately after placement, protect concrete from premature drying, excessive hot or cold temperatures and mechanical injury. Maintain minimal moisture loss at relatively constant temperature throughout period necessary for hydration of cement and hardening of concrete.

#### **M. Conductors – 600 Volt and Below.**

1. Minimum Conductor Size. All branch circuit wiring shall be minimum #12 AWG. All control circuit wiring shall be minimum #14 AWG, unless indicated otherwise. Provide larger sizes as indicated or required.
2. Branch Circuit Conductor Sizes. Provide branch circuit conductor sizes as indicated on the panelboard schedules, plans, or elsewhere. Neutral conductor size to match phase conductors

- unless indicated otherwise. Provide branch circuit switch legs and travelers as required for the switching indicated.
3. Equipment Grounding Conductor Required. For each branch circuit and feeder run, provide an equipment grounding conductor for continuous length of run, sized per NEC 250-122 (minimum), larger if so indicated.
  4. Feeders. Provide feeder conductor sizes and quantities as indicated.
  5. In Raceway. Install all wiring in conduit or other specified raceway, unless indicated otherwise.
  6. Terminations. Furnish and install terminations, including lugs if necessary, to make all electrical connections indicated or required. Make connections and terminations for all stranded AWG conductors using crimp, clamp, or box type connectors and terminators. Enclose all strands of stranded conductors in connectors, and lugs.
  7. Color. Conductors #10 and smaller shall be factory color-coded by integral pigmentation with a separate color for each phase and neutral. #8 and larger shall have stripes, bands, hash marks or color pressure-sensitive plastic tape. Color code all branch circuit and feeder conductors as follows:

- a. 208/120 Volts:

Phase	Color
A	Black
B	Red
C	Blue
Neutral	White

- b. Equipment Grounding Conductors: Green

8. Phase Arrangement. Arrange phases in all electrical equipment as follows:
  - a. A, B, C: Front to Rear
  - b. A, B, C: Top to Bottom.
  - c. A, B, C: Left to Right When Facing Established Front of Equipment.

#### **N. Equipment Connections.**

1. Connect complete, all equipment requiring electrical connections, furnished as part of this Contract or by others, unless indicated otherwise.
2. Equipment Variations. Note that equipment sizes and capacities as shown on the Contract Documents are for bidding purposes and as such may not be the exact unit actually furnished. Contractor shall anticipate minor variations in equipment and shall include in his Bid all costs required to properly connect the equipment actually furnished.
3. Verification. Obtain and review shop drawings, product data and manufacturer's instructions for equipment furnished by others. Examine actual equipment to verify proper connection locations and requirements.
4. Coordination. Sequence electrical rough-in and final connections to coordinate with installation and start-up schedule and work by other trades.
5. Rough-In. Provide all required conduit, boxes, fittings, wire, connectors and miscellaneous accessories, etc., as necessary to rough in and make final connections to all equipment requiring electrical connections. In general, motors and equipment shall be wired in conduit to a junction

- box (or safety switch) near the unit, and from there to the unit in flexible metal or liquid-tight flexible steel conduit.
6. Connections. Provide properly sized overload and short circuit protection for all equipment connected, whether furnished under this Contract or by others. Verify proper connections with manufacturer's published diagrams and comply with same. Verify that equipment is ready for electrical connections, wiring and energization, prior to performing same.
  7. Control Wiring. Provide all control wiring to remote devices or equipment as indicated or required. Modify equipment control wiring, install or disconnect jumpers, etc., as required.

**O. Hangers and Supports.**

1. General. Rigidly support and secure all electrical materials, raceway and equipment to building structure using hangers, supports and fasteners, suitable for the use, materials and loads encountered. Provide all necessary hardware.
2. Overhead Mounting. Attach overhead mounted equipment to structural framework or supporting metal framework. Do not make attachments to steel roofing, steel flooring or ceiling mineral tile.
3. Wall Mounting. Support wall mounted equipment by masonry, concrete block, metal framing or sub-framing.
4. Exterior Walls. Mount all electrical equipment located on the interior of exterior building walls, at least one inch away from wall surface, using suitable spacers.
5. Structural Members. Do not cut, drill or weld any structural member.
6. Independent Support. Do not support electrical materials or equipment from other equipment, piping, ductwork or supports for same.
7. Temporary Conditions. Do not attach to or support electrical work from removable or knockout panels or temporary walls or partitions.
8. Raceway Supports. Rigidly support all raceway with maximum spacings per NEC, and so as to prevent distortion of alignment during pulling operation. Use approved hangers, clamps and straps for individual runs. Do not use perforated straps or tie wires. Where multiple parallel raceways are run together, use trapeze type hanger arrangement made from U-channel and accessories, suspended by threaded rods, and allow at least 25% spare capacity for future installation of additional raceways. Rigidly anchor vertical conduits serving floor-mounted or "island" type equipment mounted away from walls with metal bracket or rigid steel conduit extension secured to floor.
9. Miscellaneous Supports. Provide any additional structural support steel brackets, angles, fasteners and hardware as required to adequately support all electrical materials and equipment.
10. Seismic Restraints and Supports. Provide as indicated and/or as required per seismic zone indicated.

**P. Electrical Identification.**

1. General. Locate nameplate, marking, or other identification means on outside of equipment or box front covers when above ceilings and when in mechanical or electrical equipment rooms or other unfinished areas, and on inside of front cover when in finished rooms/areas. Use Contract Document designations for identification unless indicated otherwise.
2. Nameplates. Provide nameplate engraved with equipment designation for each safety switch, panelboard, transformer, motor starter, and all other electrical cabinets, etc.

3. Underground Warning Tape. During trench backfilling for each underground electrical, telephone, signal and communications line, provide a continuous underground warning tape located directly above line, at six to eight inches below finished grade.
4. Marking Pen Labeling. Mark each junction and pull box indicating source designation and circuit number(s) for the enclosed conductors.
5. Wire Tags. For power circuits, apply wire tag indicating appropriate circuit or feeder number to each conductor present in distribution panel and panelboard gutters, and to each conductor in pull and junction boxes where more than one feeder or multi-wire branch circuit is present. Where only a single feeder or multi-wire branch circuit is present, box cover labeling and conductor color coding is sufficient. For control, communications and signal circuits, apply wire tag indicating circuit or termination number at all terminations and at all intermediate locations and boxes where more than one circuit is present.
6. Panelboard Circuit Directories. At completion of project, accurately complete each panelboard circuit directory card, identifying load served or “spare” or “space” for each circuit pole. When modifying, adding or deleting circuits at an existing panelboard, update the existing (or provide new) circuit directory card to accurately reflect final conditions.

**Q. Grounding.**

1. General. Provide all system and equipment grounding as indicated and as required by the NEC.
2. Equipment Grounding. Provide a green equipment grounding conductor, sized per NEC 250-122 (larger if so indicated) with each feeder and branch circuit run.
3. Provide exothermic welded connections where indicated.

**3.08 Cutting and Patching.**

- A. General.** Provide all cutting, drilling, chasing, fitting and patching necessary for accomplishing the work. This includes any and all work necessary to: uncover work to provide for the installation of ill-timed work; remove and replace defective work and work not conforming to the requirements of the Contract Documents; install equipment and materials in existing structures; in addition to that required during the normal course of construction.
- B. Building Structure.** Do not endanger the integrity of the building structure by cutting, drilling or otherwise modifying any structural member, without specific approval. Do not proceed with any structural modifications without written permission of the Project Structural Engineer.
- C. Repairs.** Repair any and all damage to work of other trades caused by cutting and patching operations, using skilled mechanics of the trades involved.

**3.09 Welding.** Where welding is required, such welding shall be performed in a skilled manner by certified welders. Verify that welds are free from cracks, craters, undercuts, and strikes, weld spatter, and any other surface defects. Clean and re-weld any welds deemed unacceptable in size or configuration. Do not weld to structural steel without prior written permission from the Engineer.

**3.10 Foundation.** Following the setting of the station, the Contractor shall be required to anchor the station to the foundation. The Contractor shall supply and install the required anchor bolts per the approved design documents.

**3.11 Factory Start-Up Service.** Start-up and warranty service shall be performed by the station manufacturer. A total of two (2) days for startup services and on-site operator training shall be

provided by a qualified factory-trained operator who is a regular employee of the station manufacturer to perform the following:

1. Check and approve the installation before it is placed into service and make final adjustments as necessary.
2. Supervise the equipment start-up and initial operation.
3. Operate the system in the presence of the Engineer and demonstrate the proper operation of all equipment.
4. Instruct Owner personnel on the care and maintenance of the equipment.
5. Prepare a written report summarizing the start-up and initial operation activities.
6. Revisit the project site as often as necessary until all problems are resolved and the installation and operation are entirely satisfactory in the judgement of the Owner.

**3.12 Testing.** After the station plumbing is completed, the pressure piping within the station, including valves, control valves, fittings, connections that make up the entire system shall be hydrostatically tested at a pressure of 250 psi. The test pressure shall be applied for a minimum of 20 minutes, during which time all joints, connections and seams shall be checked for leaking. Any deficiencies found shall be repaired and the system shall be retested.

The results of this testing shall be transmitted in writing to the Engineer prior to shipment of the station and shall note test pressure, time at full pressure and be signed by the Quality Control Manager or test technician.

**3.13 Disinfection.** Disinfection shall performed in accordance with Section 663 *Water Supply Utilities*.

**3.14 Field Quality Control.** Field testing shall be performed after installation of the equipment. The field testing shall demonstrate the following:

1. The equipment has been properly installed in accordance with manufacturer's instructions and recommendations.
2. The equipment has been installed in the specified location and orientation or as shown on the Contract Drawings.
3. The equipment operates without overheating or overloading of any parts, and without objectionable vibration.
4. There are no mechanical defects in any of the parts.

#### **4 METHOD OF MEASUREMENT**

The work will be measured on a lump sum bases for the installation of a factory built, above grade packed hydropneumatic/re-chlorination station. The work shall include all labor, materials, equipment, and incidentals as specified in this special note and as shown on the Drawings. The bid price shall include the cost of excavation for the station foundation and all necessary subgrade materials as recommended by the manufacturer.

## 5 **BASIS OF PAYMENT**

Payment will be made at the contract price to furnish all materials, labor and equipment necessary to satisfactorily complete the work as specified, except where specific costs are designated or included in another pay Item of work as shown on the contract plans and as specified herein:

- A. Clearing and Grubbing.** Clearing and Grubbing will be paid for under Item 201.07 “Clearing and Grubbing”
- B. Site Work.** Site work will be paid for under Item 203.02 “Unclassified Excavation and Disposal”.
- C. Electrical Service.** Utility electrical work performed at the station will be paid for under Item 662.60000208 “Furnish Electrical Service”.
- D. Telephone Service.** Utility telephone work performed at the station will be paid for under Item 662.05000001 “Furnish Telephone Service”
- E. Fiber Optic Cable.** Fiber optic cable shall be furnished under Item 683.9221121 “Fiber Optic Cable – 12 Fibers”. The cost to install the cable from the riser pole into this station shall be paid for under Item 663.10020107.

*Payment will be made under:*

<b>Item No.</b>	<b>Item</b>	<b>Pay Unit</b>
663.10020107	Packaged Hydropneumatic/Re-chlorination Station	Lump Sum



**SPECIAL NOTE****ITEM 663.10030107 - PACKAGED PRESSURE REDUCING VALVE VAULT****1 DESCRIPTION****1.01 General.**

- A. Under this item, the Contractor shall provide all labor, materials, equipment, and incidentals required to install a factory built, below-grade packaged pressure reducing valve vault in accordance with these specifications and the contract plans, complete and ready to operate. The Contractor shall provide the installation of the vault and drain piping, is responsible for pipeline connections and completion of all electrical work and raceway systems as indicated on the contract Drawings and/or as specified herein.
- B. The pressure reducing valve vault shall include, but not be limited to, all the necessary internal piping, control valves, instrumentation, and appurtenances as shown on the contract Drawings and as specified herein. The vault shall be complete when delivered to the site and will not require internal Contractor construction except where indicated on the contract Drawings.
- C. The Drawings are for the purpose of guidance and to show functional features and required external connections. They do not necessarily show all components necessary to accomplish the desired results nor do they necessarily show all components required to interface with the equipment. Exact equipment locations and raceway routing, etc. shall be governed by actual field conditions and/or instructions of the Engineer. The Contractor shall provide all parts, equipment, wiring, piping, and devices necessary to meet the functional requirements of the system.
- D. The Drawings are intended to show the general arrangement of the equipment including, but not limited to, pumps, motors, piping, fittings, valves, supports, wet well, and meter pit. They are not intended to show exact dimensions. Connection piping may have to be modified in order to accommodate the actual equipment furnished. The costs of such modifications are considered as being in the bid price and, therefore, no payment will be made for such modifications.
- E. Equipment and appurtenances vary by manufacturer. If modifications to the Drawings are required to change equipment configuration, piping, equipment supports or, appurtenances, the Contractor shall submit drawings stamped by a Professional Engineer who is licensed in the state of New York to the Engineer for approval. All related design and construction costs associated with any modifications will be the responsibility of the Contractor.

**1.02 Codes and Regulations**

- A. General: Comply with the latest recognized edition of the National Electrical Code (NEC) and all governing federal, state, and local laws, ordinances, codes, rules, and regulations. Where the Contract Documents exceed these requirements, the Contract Documents shall govern. In no case shall work be installed contrary to or below minimum legal standards.
- B. Utilities: Comply with all applicable rules, restrictions, and requirements of the utility companies serving the project site/facilities.

- C. Non-Compliance: Should any work be performed which is found not to comply with any of the above codes and regulations, provide all work and pay all costs necessary to correct the deficiencies.
- D. Arc Flash Program & Electrical Contractor shall have an OSHA compliance Arc Flash Safety Program.

### 1.03 References

- A. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified:
  - 1. American Water Works Association (AWWA).
  - 2. New York State Department of Health (NYSDOH).
  - 3. American National Standards Institute (ANSI).
  - 4. American Society for Testing and Materials (ASTM).
  - 5. National Electrical Code (NEC).
  - 6. National Electrical Manufacturer's Association (NEMA).
  - 7. National Electric Safety Code (NESC).
  - 8. Electric Testing Laboratory (ETL).
  - 9. Building Code of New York State (BCNYS).
  - 10. Insulated Cable Engineers Association (ICEA).
  - 11. Institute of Electrical and Electronic Engineers (IEEE).
  - 12. National Sanitation Foundation (NSF).
  - 13. Institute of Electrical and Electronic Engineers (IEEE).
  - 14. Steel Structures Painting Council (SSPC).
  - 15. Underwriter's Laboratories (UL)

### 1.04 Submittals.

- A. Submit the following for approval:
  - 1. Manufacturer's information, specifications, and data showing dimensions, materials of construction, and weight of all major items of equipment. Mark each submittal to clearly indicate proposed product, options, finishes, etc.
  - 2. Equipment, piping, and valve layout and schematic drawings.
  - 3. Electrical Shop Drawings: Submit for all custom equipment and systems (e.g., panelboards) to be used on the project. Shop Drawings to be newly prepared, specifically for this project, and shall include all information listed in the Shop Drawings submittal requirements in the respective specification section. Include all pertinent information such as equipment/system identification, manufacturer, dimensions, nameplate data, sizes, capacities, types, materials, performance data, features, accessories, wiring diagrams, etc, in sufficient detail so as to clearly indicate compliance with all specified requirements and standards. For control systems, provide computer generated control ladder diagrams specifically developed for this project (standard diagrams not acceptable).
  - 4. Statement of compliance with ANSI/AWWA specifications.
- B. For information: Submit an Operation and Maintenance Manual as follows:

1. Operational and maintenance manuals shall include the approved shop drawing associated with this Item, complete instructions for installation, parts list for all components, and wiring schematics and diagrams.
2. Include a list and frequency of specific maintenance activities for all equipment associated with the pressure reducing valve vault.

#### **1.05 Quality Assurance.**

- A. The Owner shall receive a completely coordinated and properly integrated pressure reducing valve vault for efficiency, ease in operation, and correct functional relationship among all elements of the system.
- B. Qualifications:
  1. All equipment provided under this Item shall be a standard product in regular production by manufacturers having a minimum of 5 years and 20 installations of proven and reliable experience in providing the equipment and services intended for this project. Supplier shall provide a list of names and dates, if requested, of installations for verification by the Engineer.
  2. A factory-authorized maintenance and parts facility shall be located within a 500-mile radius from equipment installation. The manufacturers shall show evidence of a parts inventory for all routine maintenance items associated with the supplied equipment.
- C. Installer's Qualifications: Firm with not less than five years' experience in the installation of electrical systems and equipment similar in scope and complexity to those required for this Project, and having successfully completed at least ten comparable scale projects.
- D. Certifications: Certify that the equipment installation is in accordance with manufacturer's instructions and recommendations.
- E. Incidental Work: Excavation, backfill, painting, patching, welding, carpentry, mechanical work, concrete pads and the like related to or required for work shall be performed by craftsman skilled in the appropriate trade, but shall be provided for under this item.

#### **1.06 Inspections**

- A. General: During and upon completion of the work, arrange and pay all associated costs for inspections of all electrical work installed under this contract. The cost associated with electrical inspections, reports, shall be included in this item.
- B. Inspections Required: As per the laws and regulations of the local and/or state agencies having jurisdiction at the project site.
- C. Inspection Agency: Provide electrical inspection and report performed by third party inspection agency acceptable to the Authority and local utility provider. The report shall certify that the installation is in accordance with the contract documents and applicable codes.
- D. Certificates: Submit all required inspection certificates.

- E. Coordination: Coordinate inspections with the local utility.

### **1.07 Delivery, Storage and Handling**

- A. Packing and Shipping: Deliver products in original, unopened packaging, properly identified with manufacturer's identification, and compliance labels.
- B. Storage and Protection: Comply with all manufacturer's written recommendations. Store all products in a manner which shall protect them from damage, weather, and entry of debris.
- C. Damaged Products: Do not install damaged products. Arrange for prompt replacement.

### **1.08 Warranty.**

- A. The equipment furnished under this Item shall be guaranteed to be free of defects in workmanship, design, and material. The Contractor shall replace, without cost to the Owner, any equipment or part that is defective or shows undue wear, within one (1) year after the equipment has been placed into continuous, permanent operation.
- B. The Contractor shall include the services of a factory-trained representative to provide repair service for the equipment under this Item for a period of one (1) year from date that the equipment is placed into continuous, permanent operation. The cost of all replacement parts required during this one (1) year period shall be included.

## **2 MATERIALS**

### **2.01 Manufacturers**

Provide (1) packaged pressure reducing valve vault as manufactured by the following:

- 1. Engineering Fluid, Inc., or approved equal.

### **2.02 Valve Vault Enclosure**

- A. **General.** The enclosure shall be a factory assembled valve vault of one (1) compartment all attached to a steel base and requiring no additional assembly at the job site. The structure shall be suitable by construction and materials for direct burial with water-tight integrity.
- B. **Sizing.** The vault size, as shown in the contract documents, is shown at its minimum size so that National Standards mandated clearances are maintained above, below and around equipment for proper and safe servicing, removal, and reinstallation of this equipment. The structure specified shall be of the size shown on the contract documents. The entrance manway in the location shown shall be sized to provide eventual removal and replacement of any component within the vault without altering the structure to accomplish this task.

### **2.03 Factory Construction**

- A. General.** The valve vault shall be a rolled, vertical cylinder steel structure of sealed welded construction with top, bottom, and side sheets and supplied with appropriate supporting structure. The vault design shall be reviewed and stamped by a Registered Professional Engineer licensed in the state of New York.
- B. Structure.** The plate steel employed throughout the structure shall be ½” as minimum thickness and meet or exceed the requirements for ASTM A-36. The structural shapes, channels, and angles used shall be of the thickness/weight as shown in the submittals for this item and shall meet or exceed the requirements of ASTM A-36.
- C. Reinforcement.** The top and bottom of the valve vault shall be supported and reinforced by a combination of standard structural shapes of the sizes and weights as shown in the submittal documents for this item. The structural rectangular or square tubing shall be of the wall gauge as shown in the submittal documents for this item and shall meet or exceed the requirements for ASTM A-500 Grade.
- D. Joints.** The construction of the vault as a buried system requires construction techniques necessary to ensure a long service life. The side sheet – top sheet joint construction is specified to provide maximum coating effectiveness and minimal corrosion potential by the elimination of sharp edges or abrupt transitions where coating process cannot maintain full film thickness and so promote corrosion and undercutting. The plate forming the top and bottom of the structure shall be rolled edge, cold formed prior to assembly so as to form a lap joint with the side wall.
- E. Cathodic Protection.** The vault manufacturer shall furnish for the Contractor’s proper installation two (2) seventeen pound packaged magnesium anodes for cathodic protection. The anodes shall be H-1 alloy cast to meet ASTM B-80, alloy AZ-63. The anode lead wires shall be silver soldered and potted to be waterproof. The anodes shall be buried equally spaced around the structure and connected by heavy copper wire to lugs on the vault provided for that purpose.
- F. Corrosion Protection.**
1. General. All interior and exterior surfaces of the exposed steel structure, transmission piping, and fittings shall be grit blasted equal to commercial blast cleaning (SSPC-SP6). Following fabrication all exposed surfaces of the structure, interior and exterior, shall be coated according to the following requirements.
  2. Weldment Prime Coating. All weldments will be pretreated by hand to provide additional corrosion protection using the same product as the base coat. Following the pretreatment full coating application shall take place.
  3. Base Coating. The base coating shall take place immediately after surface preparation. The protective coating shall consist of a two-component, high solids, high build, fast drying epoxy system for protection and finishing of steel and having excellent corrosion resistant properties. The epoxy system shall be self-priming and require no intermediate coatings.
  4. Finish Coating. Following the base coating application, a full finish coating application shall take place. The protective coating shall consist of a two-component, high solids, high build, fast drying epoxy system for protection and finishing of steel and having excellent corrosion resistant properties. The epoxy system shall be self-priming and require no

intermediate coatings. The base and finish coats shall provide a total dry mil thickness of 8.0 mils.

5. Post Assembly Coating. Following assembly and just prior to shipping, there shall take place a thorough cleaning of the floor of the structure followed by a rolled on coating of the two part epoxy coating to cover over any scuffing or scaring that might have occurred during assembly.

## 2.04 Components

- A. Entrance Manway.** The entrance manway shall have a minimum clear inside opening of thirty (30) inches by thirty-six (36) inches. The covers shall be made of aluminum on the exterior. The covers shall be insulated with a minimum of one (1) inch of fiberglass insulation, covered and protected by an aluminum liner.

The entry locks shall be flush mounted, in the scuttle riser in position to be protected from the elements by the cover skirt. Two (2) keys will be provided for the vault, on a key ring complete with the manufacturer's identification. The hatch shall be bolted to a hatch extension of the structure. Bolted connection should stay above the surface of the finished grade to allow changing out the hatch. Non-shrink closed cell foam gasket shall be used to make positive seal between the top of the hatch extension and the bottom flange on the hatch.

1. Approved manufacturer:
  - a. Bilco Model MS-50, or approved equal

- B. Access Ladder.** An all-aluminum access ladder shall be provided for the vault. The ladder shall be a Type 1A with 300 lbs. load rating and meet ANSI A14.3 fixed ladder standard. The ladder shall have serrated rungs with 3" full I-Beam side rails.

The uppermost ends of the side rails will be protected by plastic caps bolted into place. The complete access ladder will be bolted into place at a minimum of two (2) points both top and bottom so as to be easily removable to facilitate equipment maintenance.

1. Ladder Assist Device. A ladder up safety post shall be installed on the vertical centerline of each ladder.

- C. Safety Floor Matting.** The walkway areas shall be covered with a rubber drainage runner. The runner shall be medium duty, 1/2 inch minimum thickness of open slot design allowing fluids to drain understanding or walking surfaces. The runner shall have a tread design to promote sure footing. The underside of the runner shall have a raised knob design to permit aeration and drainage, and to reduce runner fatigue. The runner shall not be glued to the floor.

- D. Adaptors and Couplings.** All plumbed devices within the vault eventually requiring service, such as meters, control valves, pumps and like equipment, shall be easily removed from the piping by the presence of appropriately placed and sufficient quantity of adaptors and couplings as shown on the contract documents; no less than the quantity of couplings and adaptors shown shall be allowed. All compression couplings shall include a minimum of two (2) zinc coated steel threaded rods across the joint with appropriate bolted restraining points.

- E. Pressure Gauges.** Combination pressure gauges shall have a built-in pressure snubber and have 4-1/2" minimum diameter faces and turret style case, black fiberglass-reinforced thermoplastic with a clear acrylic window with Buna-N gasket. The gauge shall have a 1/4" MNPT lower mount process connection and contain a 0.6mm copper alloy restrictor. Gauge ranges shall be 0-160 psi for each of the inlet and outlet gauges for the vault.

All gauges will be panel mounted off the pipeline and be connected to their respective sensing point. The gauge trim tubing shall be complete with both isolating and vent valves and the tubing shall be so arranged as to easily vent air and facilitate gauge removal. Gauges mounted directly to the pipeline or at the sensing point will not be accepted. Gauge ranges, markings and gauge location shall be identified in the contract documents.

- F. Static and Sensing Lines.** All gauge, switch, and transmitter sensing lines shall be minimum 1/4" OD white polypropylene tubing run from the sensing point and a ball valve to the point of device mounting.

The pilot tubing shall be run in a workmanlike manner with elastomeric/stainless steel mounting straps to securely hold the tubing to be free of stress and vibration. The alignment and organization of the sensing lines shall be continuously rising.

- G. Sample Tap.** A single, right angle outlet, smooth nose, brass sample tap shall be affixed to the manual vent ball valve for the low suction lockout and suction pressure gauge assembly.
- H. Hose Bibb.** There shall be provided a standard hose bibb with valve and vacuum breaker on the suction piping. The hose bibb connection shall be through a pressure regulator,
- I. Vent Pipe.** Vent pipe size and configuration shall be as shown on the contract documents. The vent pipe and fittings shall be Schedule 40 PVC pipe. The vent outlet shall be fitted with a stainless steel bug screen. Vent pipe and fittings shall conform to the material requirements of ASTM D1784 and shall be manufactured in accordance with ASTM 1785 and ASTM D2665 for Schedule 40 PVC pipe.
- J. Floor Sump.** The valve vault shall be complete with a sump. The sump shall be a minimum of eighteen (18) inches in diameter and eight (8) inches deep.

## 2.05 Piping

- A. General.** Piping shall be steel and conform to material specification ASTM A-53(CW) for nominal pipe size four (4) inch and smaller and ASTM A-53(ERW) Grade B for nominal pipe size five (5) inches and larger. Steel butt-welding fittings shall conform to material specification ASTM A-234 Grade WPB and to the dimensions and tolerances of ANSI Standards B16.9 and B16.28 respectively. Fittings shall conform to the requirements of AWWA C208.

Forged steel flanges shall conform to material specification ASTM A-105 Class 60 and/or ASTM A-181 for carbon steel forgings and to the dimensions and tolerances of ANSI Standards B16.5 as

amended in 1992 for Class 150 and Class 300 flanges. Pipes 10 inch and smaller shall be Schedule 40.

- B. Interior Coating.** The internal surfaces of piping to be fusion bonded coated shall be grit blasted to an SP-10 finish with the finish profile required by the coating material manufacturer. The internal, wetted surfaces of the steel transmission piping shall have applied to it a Fusion Bonded Epoxy Coating on the interior pipe surface. The coating shall be applied and meet the testing requirements of AWWA C213. The powder coating product shall be National Sanitation Foundation (NSF) Standard 61 certified material. The epoxy powder coating shall be Tnemec Series FC20 or approved equal.

Prior to shipment of the structure, the vault manufacturer shall provide in writing to the Engineer certification that the fusion bonded epoxy coating has been applied to all internal surfaces of the steel piping using the proper method. Said certification shall show under the structure's manufacturer's letterhead:

1. Date of application.
2. Material manufacturer and product designation including a product data sheet for the coating.
3. Applier of the fusion bonded coating, name, address and phone number.
4. Notarized signature of an officer of the vault manufacturing company stating the fusion bonded epoxy coating was applied to AWWA Standard C213-91 or the latest revision.

- C. Wall Penetrations.** Any ferrous metal device, namely water transmission piping and conduits passing through the vault wall shall be welded fully long its circumference or length, being welded on both sides of the wall using a metal-added, MIG shielded arc welding process.

## 2.06 Pipe Supports

- A. General.** Pipe supports by minimum sizing:

1. 8 inch or less piping shall be 2" x 3" x 3/16" wall rectangular tubing.
2. 10" and larger piping shall be 3" x 4" x 1/4" wall rectangular tubing.
3. 6 inch or larger piping shall be provided with "kick" bracing projecting fully from the underside of the pipe to the floor at an angle of no less than 15° from vertical out at a right angle to the run of the pipe being supported. These "kick" braces shall be in addition to the vertical pipe supports called out above.

- B. Welding.** Pipe supports are to be fully welded at both end points to the pipe and steel floor where required. Where components are to be supported and may require disassembly at some time, the supports for these components shall be welded at the bottom and bolted at the top by use of a bolt yoke welded to the top of the support and bolted into the flange connection picking up at least three bolts.



## 2.07 Valves

- A. General.** All valves shall be certified to NSF/ANSI 61, Drinking Water System Components – Health Effects, and certified to be Lead-Free in accordance with NSF/ANSI 372. All valves shall conform to all applicable AWWA standards.
- B. Ball Valves.** For piping of less than 3" size ball valves shall be used. The ball valves shall meet or exceed ASTM Spec B124 No. C37700. The ball valves will be 2-piece forged brass body, blow out proof stem, TFE seats, TFE packing with adjustable stem packing gland. The valves will be NPT threaded pattern complete with lever operators. Maximum working pressure shall be 600 psi.
- C. Butterfly Valves.** Butterfly valves shall conform to the requirements of AWWA C504, shall be wafer style, for ANSI Class 125/150 flange bolting and have a metal reinforced, dovetail seat for drip-tight, bi-directional shutoff. The valve shall be manufactured for a working pressure of 250 psi. The valve stem shall be one piece connected to the disk by stainless steel torque plugs with upper and lower RTFE inboard stem bearings and heavy duty upper stem bushing. The valve body shall be cast iron with stainless steel disk and stem, EPDM seat, polyester upper stem bushing and NBR stem seal.

Valves 6" and smaller shall be equipped with a lever operator with 10 degree throttle stops capable of withstanding 450 ft. lbs. of input torque and mounted to the valve trunnion with 4 bolts. Valves 8" and larger valves shall be equipped with a weatherproof, heavy duty travelling nut style hand-wheel operators capable of withstanding 450 ft. lbs. of input torque and mounted to the valve trunnion with 4 bolts.

1. Approved manufacturer:
  - a. Keystone 221-786, or approved equal.

- D. Pressure Relief Valve.** Pressure relief valves shall conform to the requirements of AWWA C530. The valve configuration as shown shall be hydraulically operated, single diaphragm actuated. The valve shall consist of three major components: the body with seat installed, the cover with bearing installed, and the diaphragm assembly. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve, separating operating pressure from line pressure. Packing glands and/or stuffing boxes are not permitted and there shall be no pistons operating the main valve or pilot controls. Valve body and cover shall be epoxy coated. The stainless steel seat with integral bearing shall be of the solid, one piece design.

The diaphragm assembly shall contain a non-magnetic stainless steel stem of sufficient diameter to withstand high hydraulic pressures. The stem shall be fully guided through its complete stroke by a removable bearing in the valve cover and an integral bearing in the valve seat. No center guides shall be permitted. The stem shall be drilled and tapped in the cover end to receive and affix such accessories as may be deemed necessary.

The flexible, non-wicking, FDA approved diaphragm shall consist of nylon fabric bonded with synthetic rubber compatible with the operating fluid. The diaphragm shall be fully supported in the valve body and cover by machined surfaces which support no less than one-half of the total

surface area of the diaphragm in either the fully open or fully closed position.

The pilot control system shall include CK2 isolation valves. The pilot system shall include closing speed control on all valves. Pilot controlled sensing shall be upstream of the pilot system strainer so accurate control may be maintained if the strainer is partially blocked.

The pressure relief pilot shall be a direct-acting, adjustable, spring-loaded, diaphragm valve designed to permit flow when controlling pressure exceeds in the adjustable spring setting. The pilot control is normally held closed by the force of the compression on the spring above the diaphragm and it opens when the pressure acting on the underside of the diaphragm exceeds the spring setting. The pressure relief valve shall be supplied with the Dura-Kleen® stem (KD option).

The 2.5-inch pressure relief valve shall be field-set to 5 psi above the mainline 4-inch pressure reducing valve set point.

1. Approved manufacturer:
  - a. Cla-Val Model 50-01, or approved equal

**E. Pressure Reducing Valve.** Pressure reducing valves shall conform to the requirements of AWWA C530. The valve configuration as shown shall be hydraulically operated, single diaphragm actuated. The valve shall consist of three major components: the body with seat installed, the cover with bearing installed, and the diaphragm assembly. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve, separating operating pressure from line pressure. Packing glands and/or stuffing boxes are not permitted and there shall be no pistons operating the main valve or pilot controls. Valve body and cover shall be epoxy coated. The stainless steel seat with integral bearing shall be of the solid, one piece design. The valve shall be manufactured with anti-cavitation trim to eliminate damage associated with cavitation.

The diaphragm assembly shall contain a non-magnetic stainless steel stem of sufficient diameter to withstand high hydraulic pressures. The stem shall be fully guided through its complete stroke by a removable bearing in the valve cover and an integral bearing in the valve seat. No center guides shall be permitted. The stem shall be drilled and tapped in the cover end to receive and affix such accessories as may be deemed necessary.

The flexible, non-wicking, FDA approved diaphragm shall consist of nylon fabric bonded with synthetic rubber compatible with the operating fluid. The diaphragm shall be fully supported in the valve body and cover by machined surfaces which support no less than one-half of the total surface area of the diaphragm in either the fully open or fully closed position.

The pilot control system shall include CK2 isolation valves and X46 flow clean strainer. The pilot system shall include an opening and closing speed control on all valves. Pilot controlled sensing shall be upstream of the pilot system strainer so accurate control may be maintained if the strainer is partially blocked.

The pressure reducing pilot control shall be a direct-acting, adjustable, spring-loaded, normally open, diaphragm valve designed to permit flow when controlled pressure is less than the spring

setting. The pilot control is held open by the force of the compression on the spring above the diaphragm, and it closes when the delivery pressure acting on the underside of the diaphragm exceeds the spring setting. The pilot control system shall include a fixed orifice.

The 1-inch bypass pressure reducing valve shall be field-set to 50 psi. The 4-inch mainline pressure reducing valve shall be field-set to 5 psi above the bypass valve set point.

1. Approved manufacturer:
  - a. Cla-Val Model 690-01KO (Mainline Valve) and Model 90-01KO (Bypass Valve), or approved equal

## 2.08 Electrical

- A. Grounding.** Each electrical equipment item in the vault shall be properly grounded per Section 250 of the National Electrical Code. Items to be grounded include, but are not limited to; convenience receptacles, dedicated receptacle for heater, dehumidifier, lights, light switch, exhaust fans and pressure switches.

All ground wires from installed equipment shall be in conduit and shall lead back to the control panel to a copper ground buss specific for grounding purposes and so labeled. The ground buss shall be complete with a lug large enough to accept the installing electrician's bare copper earth ground wire. The bus shall serve as a bond between the earth ground and the equipment ground wires.

- B. Electrical Service.** The electrical service provided for the pressure reducing valve vault shall be 240/120 volt, 1 phase, 60 Hertz, 3 wire.
- C. Circuit Breaker Panel.** All circuit breakers, relays and controls shall be incorporated into one (1) NEMA 1 control panel.

There shall be provided, thermal-magnetic trip circuit breakers as follows:

1. Twelve (12) Auxiliary Circuit Breakers:
    - a. 1p, 15amp Controls
    - b. 1p, 15amp Lights
    - c. 1p, 15amp Convenience Outlets
    - d. 1p, 15amp Dehumidifier
    - e. 2p, 20amp Heater
    - f. 1p, 15amp Ventilation Fan
    - g. 1p, 15amp Sump Pump
    - h. Two (2) Spare
- D. Interior Electrical Conduit and Wiring.** All service entrance conduits power and signal, shall be rigid steel conduit, individually sized to accept the inbound service conductors.

These service entrance conduits shall be installed from the main power or control panel through the steel sidewall or the building floor and terminate exterior to the equipment enclosure as a thread

hub. The service entrance exterior conduit connection points shall be capped or plugged for shipment.

All wiring within the equipment enclosure and outside of the panel enclosures shall be run in conduit except where watertight flexible conduit is properly used to connect pump drivers, fan motors, solenoid valves, limit switches, etc., where flexible connections are best utilized.

Devices and appliances where furnished by the original manufacturer and being equipped with a UL approved rubber cord and plug, may be plugged into a receptacle. Equipment enclosure conduits shall be rigid, heavy wall, Schedule 40 PVC with solvent weld moisture proof connections, in minimum size 3/4" or larger, sized to handle the type, number and size of equipment conductors to be carried.

The conduiting shall be in compliance with Article 347 of the National Electrical Code and NEMA TC 2, Federal WC 1094A and UL 651 Underwriters Laboratory Specifications. Where flexible conduit connections are necessary, the conduit used shall be Liquid tight, flexible, totally nonmetallic, corrosion resistant, nonconductive, U.L. listed conduit sized to handle the type, number and size of equipment conductors to be carried in compliance with Article 351 of the National Electrical Code.

Motor circuit conductors shall be sized for load. All branch circuit conductors supplying a single motor of one (1) horsepower or more shall have an ampacity of not less than 125 percent of the motor full load current rating, dual rated type THHN/THWN, as set forth in Article 310 and 430 B of the National Electrical Code, Schedule 310 13 for flame retardant, heat resistant thermoplastic, copper conductors in a nylon or equivalent outer covering.

Control and accessory wiring shall be sized for load, type MTW/AWM (Machine tool wire/appliance wiring material) as set forth in Article 310 and 670 of the National Electrical Code, Schedule 310 13 and NFPA Standard 79 for flame retardant, moisture, heat and oil resistant thermoplastic, copper conductors in compliance with NTMA and as listed by Underwriters Laboratories (AWM), except where accessories are furnished with a manufacturer supplied UL approved rubber cord and plug.

**E. Dehumidifier.**

1. One (1) installed as shown.
2. Capacity 30 pints per 24 hours.
3. Compressor rated 115 volts, 60 Hz, 4.3 operating amps.
4. 106 CFM fan, 2 fan speed.
5. Humidity range 35 to 80% RH, ambient temperature range of 41 to 95 F, Type R410A refrigerant.
6. Washable filter.
7. Condensate piped direct to drain.
8. UL listed rubber cord.

**F. Heaters.**

1. Quantity as shown on the contract documents, wall mounted as shown.
2. Rating - 10,239 BTU/HR - 3000 watts, 240 volt.

3. Enclosed resistance wire within steel finned element.
4. Control - thermostat.
5. UL listed.
6. Fan forced.
7. Hard wired in conduit per UL 400-1.

#### **G. Exhaust Fan**

1. One (1) installed as shown.
2. Capacity: 230 CFM of free air at 0.2 inch static pressure.
3. Shaded pole motor - squirrel cage blower.
4. Hard wired in conduit to conduit box on motor per UL 400-1.
5. 120 volt A.C. operation from wall mount thermostat and HAND/AUTO switch on main control panel.
6. Hatch installed limit switch to activate exhaust fan whenever the entrance hatch is open.
7. Exhaust air piping - 3 inch minimum.
8. Air return piping - 3 inch minimum.
9. Exhaust and return piping protected by 180° PVC return bend with removable insect screen.

#### **H. Light Fixture**

1. One LED lighting fixture, damp listed, corrosion resistant non-metallic body and switch mounted at entry hatch.

#### **I. Sump Pump**

1. One (1) each, installed as shown.
2. Capacity 19 gpm at 15 feet TDH.
3. Vortex type Impeller - plastic, glass filled with metal insert.
4. Cast iron motor shell, switch case and pump housing.
5. UL listed submersible oil filled motor - UL listed rubber power cord - 120 volt AC operation.
6. Float operated, submersible (NEMA 6) mechanical switch.
7. Completely submersible, hermetically sealed.
8. Auto reset thermal overload protection.
9. PVC pump discharge piping 1 1/2" x 1 1/4" with single check valve - union both sides.
10. Provision for dewatering drain system for freeze protection.

### **2.09 Exterior Electrical Service Connection**

#### **A. Electrical Connection.**

1. General. The Contractor shall be required to make a complete electric service connection from the existing NYSEG electric pole as shown on the contract Drawings, and as specified herein. The electric service connection shall include:
  - a. Riser Pole Connection
  - b. Raceway System
  - c. Grounding of electrical components
  - d. Mounting a Meter and Meter socket per Utility requirements and the Drawings

- e. All additional required work as shown on the plans, as specified by the station Manufacturer, and/or as ordered by the Engineer to fully complete the electric service connection.
  2. Electrical Service. The electrical service provided for the booster pumping station shall be 480 volt, 3 phase, 60 Hertz, 4 wire.
- B. Raceway Systems.** As required by the NEC (minimum) with oversized raceways as indicated and where required for ease of pulling cable. Minimum conduit size: 3/4-inch, unless indicated otherwise.
1. Raceway Types. Rigid galvanized steel conduit, electrical metallic tubing (EMT), flexible steel conduit, liquid-tight flexible steel conduit and Schedule 40 heavywall and Schedule 80 extra-heavywall rigid non-metallic (PVC) conduit, conforming to applicable ANSI, NEMA and UL standards.
  2. Fittings. All raceway fittings (except for rigid non-metallic conduit) to be steel or malleable iron, and UL-listed for the intended application. EMT fittings to be compression type.
  3. Pull and Junction Boxes, and Wireways: Use as indicated and required. Junction and pull boxes for general indoor use (dry locations) to be of galvanized code gauge steel construction, minimum 4" square by 1-1/2" deep, with screw-on covers. Wireways to be UL listed, sheet steel construction with screw-on covers.
  4. For exterior and damp or wet indoor locations, use boxes and wireways approved for such use.
  5. Handholes: Light-weight and high-strength, constructed of fiberglass reinforced polymer concrete, gray color, suitable for use at temperatures down to -50°F, and resistant to sunlight, weathering, chemicals and freeze-thaw cycles, with bolt-on cover (with standard logo indicating type of service), and designed for in-grade use in areas with light vehicular traffic (5,000 lb. load over 10"x10" area). Acceptable Manufacturers: Quazite "Composolite," Styles "PC" or "PG", or approved equal.
  6. Pipe Sleeves: Rigid steel conduit or iron pipe.
  7. Conduit Seals: For Cast-in-Place Concrete Applications: Acceptable Manufacturers: O-Z/Gedney Type "FSK"; Thunderline Corp. "Link Seal" with "Link Seal Wall Sleeve", or approved equal. For Core Drilled and Pre-Cast Opening Applications: Acceptable Manufacturers: O-Z/Gedney Type "CSML"; Thunderline corp. "Link Seal", or approved equal.
  8. Pull Wires: No. 14 AWG zinc-coated steel monofilament plastic line with 200 lb. tensile strength.
- C. 600 Volt Class Wire.** All wire and cable shall be constructed in accordance with all applicable ICEA, NEMA and IEEE published standards, and shall be UL-listed and labeled. Single-conductor, 98% conductivity, annealed, uncoated copper conductors with 600-volt rated type "THHN/THWN" insulation. Wire shall be annealed bare copper per ANSI/ASTM B3, UL 83, and Federal Specification JC-30A with 600 volt insulation, be stranded (except for #10 AWG and smaller may be solid), and be minimum size #12 AWG (Except for control wiring and signal circuits).
1. Insulation: Provide THHN/THWN insulation for all conductors, except XHHW insulation may be used for conductors #4 and larger.

2. Ampacity of conductors shall be rated for 75 degrees C regardless of temperature of conductor insulation when combining circuits in one conduit. Derate conductors and increase size per NEC when installing multiple circuits in a raceway, utilizing 75°C ampacity table.
3. Connectors: Nylon shell insulated metallic screw-on connectors for #14-10 AWG, and bolted pressure or compression type lugs and connectors with insulating covers for #8 AWG and larger.

**D. Hangers and Supports.** All hangers, supports, fasteners and hardware shall be zinc-coated or of equivalent corrosion resistance by treatment or inherent property, and shall be manufactured products designed for the application. Products for outdoor use shall be hot dip galvanized.

1. Types: Hangers, straps, riser supports, clamps, U-channel, threaded rods, etc. as indicated and/or required.
2. Seismic restraints and supports as indicated and/or required.

**E. Electrical Identification.**

1. Nameplates. Three-layer laminated plastic with minimum 3/16" high white engraved characters on black background, and punched for mechanical fastening. Fasteners: self-tapping stainless-steel screws or number 10-32 stainless steel machine screws with nuts and flat and lock washers. Each nameplate on all panelboards and switchgear shall indicate the following:
  - a. Panel Name
  - b. Voltage, Phase, Number of Wires
  - c. Source
2. Underground Warning Tape: Six-inch wide polyethylene tape, permanently bright colored with continuous-printed legend indicating general type of underground line below and "CAUTION." Colors as follows:
  - a. Red – Electric
  - b. Orange - Communications
3. Marking Pens: Permanent, waterproof, quick drying black ink. Acceptable Manufacturers: Sanford Fine Point "Sharpie," or equal.
4. Wire Tags: Vinyl or vinyl-cloth self-adhesive wraparound type indicating appropriate circuit number, etc.
5. Arc Flash Panelboard Stickers: Provide per NEC 110.16.

**F. Grounding.** Ground rods, conductors, clamps and connectors, etc as required;

1. Ground Rods: Minimum 3/4" diameter by 10' long copper clad steel.
2. Welded Connectors: Exothermic process.

**G. Firestopping Materials.**

1. General: Firestop systems composed of firestop compounds and appropriate damming materials installed together with the penetrant (e.g., conduit) to form a complete firestop system, providing a fire resistant rating at least equal to the hourly fire resistance rating of the floor, wall or partition into which the firestop system is to be installed.
2. Test Standards: Firestopping materials shall be tested together as a system to the time/temperature requirements of ASTM E119 and shall be tested to UL 1479 (ASTM E814) and be UL classified for up to 3 hours.

3. Firestop Sealants: Non-hardening, conformable, intumescent putties, sealants or other compounds, containing no toxic solvents or asbestos, and exhibiting aggressive adhesion to all common building materials and penetrants, while allowing reasonable movement of the penetrants, without being displaced. Compounds shall be waterproof, non-toxic and smoke and gas tight.
4. Firestop Mortars: Light-weight, water-based, cementitious, fast drying, low density mortar, non-shrinking and non-cracking during its cure, and which forms a surface capable of being sanded, bored and painted.
5. Damming Materials: Mineral wool or ceramic fiber.
6. Multi-Cable Transits: Assemblies consisting of a frame, a compression mechanism, and grooved insert sealing modules sized for multiple penetrating elements of various sizes.
7. Acceptable Manufacturers: Hilti; Heavy Duty/Nelson; International Protective Coatings; Specified Technologies, Inc.

#### H. Concrete Work

1. Concrete shall be as follows;
  - a. Minimum Strength: 3000 psi @ 28 days
  - b. Aggregate: 3/4" aggregate
  - c. Cement: 588 #/cu. yd. minimum, type I or II
  - d. Slump: 4" maximum
  - e. Air: 5% - 7%
2. Reinforcing: Grade 60 bars, galvanized, sized as indicated, and 6" x 6" - W1.4 x W1.4 mesh, galvanized, and other reinforcing as indicated.
3. Forms: Wood, metal or other approved materials, constructed so as to withstand the forces of the newly placed concrete.
4. Equipment Pads: Minimum 4" thick indoor, 12" thick outdoor (with 9" below grade), with 1" x 45° chamfer on all top edges. For on grade installations provide 12" layer of crushed stone beneath pad. For pads to be placed on concrete floors, provide anchors into concrete floor. Comply with equipment manufacturer's specifications and/or utility company requirements.

**2.10 Spare Parts.** Provide one set of spare lights, fuses, and breakers.

### 3 CONSTRUCTION

**3.01 General.** Equipment installation shall be in complete conformance to manufacturer's instructions.

**3.02 Shipment and Delivery.** The valve vault manufacturer will be required to deliver the structure complete and undamaged by the manufacturer's carrier to the site. The vault shall be fully assembled and ready for the power, with inlet, outlet, and drain piping connections to be completed on site.

The valve vault manufacturer shall provide the spreader bars, and any on site rigging required for off-loading and final placement of the structure at the site.

**3.03 Site Preparation and Execution.** Excavation of the valve vault shall be in accordance with Section 206 *Trench, Culvert, and Structure Excavation*. Compaction of each layer shall be in accordance with



§203-3.03C *Compaction*. Backfill material at structures shall be in accordance with §203-1.01H *Suitable Material*.

**3.04 Access.** The Contractor must provide a level unobstructed area large enough for crane and tractor-trailer to park adjacent to the vault site. Crane must be able to place outriggers within 5'-0" of edge of valve vault site and truck and crane must be able to get side by side under their own power.

**3.05 Pipeline Connections.** Install as specified by the station manufacturer and as shown on the Drawings.

**3.06 Sump Discharge Piping.** The Contractor shall install plastic sump pump discharge pipe and fittings as per the Drawings. The pipe shall be fitted with a stainless steel screen at pipe discharge.

### **3.07 Electrical Service Connection**

**A. General.** The installation of all electrical work and connections shall be in accordance with the intent of the Contract Documents, as determined by the Engineer.

All materials and equipment shall be installed as recommended by the respective manufacturers, by mechanics experienced and skilled in their particular trade, in a neat and workmanlike manner, in accordance with the standards of the trade, and so as not to void any warranty or UL listing.

All electrical work shall be performed under the Contractor's direct supervision, using sufficient and qualified personnel as necessary to complete the work in accordance with the progress schedule. The Contractor shall assign one or more competent supervisors who shall have authority to accept and execute orders and instructions, and who shall cooperate with the other Contractors and subcontractors, the Engineer and Owner in all matters to resolve conflicts and avoid delays.

**B. Conditions Verification.** Examine the areas and conditions under which the work is to be performed, and identify any conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

**C. Coordination.** Sequence, coordinate and integrate the installation of all electrical materials and equipment for efficient flow of work, in conjunction with the other trades. Review the Drawings for work of the other trades, and report and resolve any discovered discrepancies, prior to commencing work.

1. Cooperation. Cooperate with the other Contractors and individual disciplines for placement, anchorage and accomplishment of the work. Resolve interferences between work of other disciplines or Contractors, prior to commencing installation.
2. Chases, Slots, and Openings. Arrange for chases, slots, and openings during the progress of construction, as required to allow for installation of the electrical work.
3. Supports and Sleeves. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
4. Obstacles and Interference. When installing equipment and raceways, provide offsets, fittings, accessories and changes in elevation or location as necessary to avoid obstacles and interferences, per actual field conditions.

5. Space Requirements. Electrical equipment sizes indicated on drawings are generally based on specified manufacturer. Verify that the proposed equipment will fit in the space indicated on the drawings. Maintain clearances required by NEC.

#### **D. Dimensions.**

1. Vault Dimensions. For exact locations of vault elements, refer to dimensioned drawings. However, field measurements take precedence over dimensioned drawings.
2. Site Dimensions. Field measurements take precedence over scaled electrical site plans.
3. Establish the exact location of electrical equipment based on the actual field verified dimensions of equipment furnished.

#### **E. Electrical Installation.**

1. Unfinished and Finished Areas. For the purposes of these electrical specifications, "unfinished" areas shall include the vault interior. All other areas shall be considered "finished" spaces, unless indicated or approved otherwise.
2. In Unfinished Areas: Raceways, equipment and devices may be installed concealed or exposed, unless indicated otherwise.
3. In Finished Areas: Conceal all raceway and flush mount all electrical boxes, equipment, and devices unless indicated or approved otherwise. The space above suspended ceilings or behind furred spaces is considered outside finished areas and electrical materials installed within these areas are considered concealed.
4. Minimum Mounting Height. Install exposed raceway and all other electrical equipment (e.g., lighting fixtures) with not less than 7'-6" clear to finished floor, unless indicated or approved otherwise, and excluding raceway and equipment mounted on walls.
5. Dimensions and Clearances. Field measure all dimensions and clearances affecting the installation of electrical work, in relation to established datum, building openings and clearances, and work of other trades, as construction progresses.
6. Rough-In Locations. Verify final locations for rough-ins with field measurements and requirements of actual equipment being installed.
7. Door Swings. Verify the swings of all doors before switch outlets or other electrical devices are installed. If necessary, relocate devices so they are not obstructed by doors when doors are open.
8. Ceiling Mounted Devices. The locations indicated on the architectural reflected ceiling plans take precedence over the electrical documents, in the event of conflict.
9. Install equipment, conduit, cable tray, hangers, and supports to withstand seismic forces for the seismic zone of the installation.

#### **F. Layout**

1. General. Install electrical systems, materials and equipment level and plumb, and parallel and perpendicular to other building systems and components, where installed exposed.
2. Serviceability. Install electrical equipment and raceways, etc. to readily facilitate servicing, maintenance and repair or replacement of components, and so as to minimize interference with other equipment and installations.
3. Clearances. Prior to commencing work, verify that all electrical equipment will adequately fit and conform to the indicated and code required clearances, in the spaces indicated on the Drawings. If rearrangement is required, submit plan and elevation drawings or sketches

indicating proposed rearrangement, for the Engineer's approval. Do not rearrange without express written permission of the Engineer.

#### **G. Holes, Sleeves, and Openings.**

1. General. Provide all holes, sleeves, and openings required for the completion of the work and restore all surfaces damaged, to match surrounding surfaces. Maintain integrity of all fire and smoke rated barriers using approved firestopping systems. When cutting holes or openings, or installing sleeves, do not cut, damage or disturb structural elements or reinforcing steel, unless approved, in writing, by the Engineer.
2. Conduit Penetrations. Size core drilled holes so that an annular space of not less than 1/4" and not more than 1" is left around the conduit. When openings are cut in lieu of core drilled, provide sleeve in rough opening. Size sleeves to provide an annular space of not less than 1/4" and not more than 1" around the conduit. Patch around sleeve to match surrounding surfaces.

#### **H. Firestopping Systems.**

1. General. Install firestopping at all electrical raceway and cable penetrations through floor structures and interior walls or partitions which are time-rated fire and/or smoke barriers.
2. Preparation. Prior to installation, verify that all penetrating elements and supporting devices are permanently installed and that surfaces which will be in contact with penetration seal materials are clean and free of dust, dirt, grease, oil, loose materials, rust or other substances.
3. Installation. Install firestop systems in accordance with UL approved design details and the manufacturer's instructions. Install sleeves, conduits and cables with required clearance spaces, allowing installation of sealing materials. Do not exceed the outside diameter of the sleeve, conduit or cable by more than one inch or by less than 1/4" when making openings for penetrations. Install firestop systems so as to completely seal openings to prevent passage of smoke and water.

#### **I. Underground Work.**

1. General. Perform all excavating, trenching and backfilling, etc. as indicated or required for the installation of all underground electrical work. Coordinate work with other trades and verify existing underground services and conditions.
2. Conduit Burial Depth. 30" below finished grade. All excavation and burial depths indicated are below finished grade.
3. Excavating. Do not excavate below required depth, except as necessary for removal of unstable soil or when rock is encountered. When rock is encountered, excavate six inches below the required depth and backfill with a minimum 6" layer of crushed stone or gravel between rock bearing surface and the electrical installation. Stockpile satisfactory excavated materials where directed, until required for backfilling. Remove and legally dispose of excess excavated materials and materials not suitable for backfill use. Shore and brace as required for stability of excavation. Remove shoring and bracing when no longer required. Where sheeting is allowed to remain, cut top of sheeting off at an elevation of 30" below finished grade.
4. Protection. Protect structures, utilities, sidewalks, pavements and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by excavations.

5. Existing Utilities. Remove existing electrical and other utility lines so indicated. Where existing utilities which are to remain exist within areas of excavation, locate such utilities and support and protect during excavation operations.
6. Trenching. Cut all trenches neatly and uniformly and so as to provide ample working room and at least six inches clearance on both sides of raceways, etc., unless otherwise noted. Take necessary precautions when working near existing underground utilities, and coordinate with the installation of concurrent utilities by other trades. Unless indicated otherwise, pitch all electrical conduit runs downward away from buildings, manholes, and pad mounted equipment. Excavate trenches to depth indicated or required. Limit length of open trench to that in which installations can be made and trenches backfilled within the same day.
7. Sand Envelope. Install a minimum envelope of three inches (top, bottom, and sides: three inches each) of fine grain sand around all electrical cables and conduits installed below grade unless indicated otherwise.
8. Preparation for Backfilling. Backfill excavations as promptly as work permits, but not until completion of inspection, testing, approvals, and recording of underground utility locations. Prior to backfilling, remove all concrete form work, shoring, bracing, trash and debris.
9. Backfilling. Use only approved materials free from boulders, sharp objects and other unsuitable materials. Match the final elevations and materials of areas affected by electrical excavating, trenching and backfilling. Replace conduit and cables damaged by improper backfilling. Replace surface materials to match existing surface materials if no other utility or site work is being done in area. Place specified soil materials in 4" - 8" layers to required subgrade elevations, for area classifications as follows:
  - a. Under Building Slabs: Use drainage fill materials.
  - b. Under Piping and Equipment: Use subbase materials where required over rock bearing surfaces and for correction of unauthorized excavation.
  - c. For Raceways Less below Surface of Paved Areas, Driveways, or Roadways: Provide 4" thick concrete base slab support. After raceway installation, provide 4" thick concrete encasement (sides and top) prior to backfilling and placement of roadway subbase. Refer to contract Drawings for Details.
10. Backfill Placement. Place backfill and fill materials in layers of not more than 8" in loose depth for material compacted by heavy equipment, and not more than 4" in loose depth for material compacted by hand-operated tampers. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification specified below. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice. Place backfill and fill materials evenly adjacent to structures, piping, and equipment to required elevations. Prevent displacement of raceways and equipment by carrying material uniformly around them to approximately same elevation in each lift.
11. Compaction. Compaction shall be in accordance with the Section 203-3.03C *Compaction*.
12. Detectable Warning Tap. Install detectable warning tape 18" below grade.

#### **J. Raceway Systems.**

1. Raceway Types. Unless indicated otherwise, use raceway types as follows:
  - a. Indoors, Concealed in Walls or Above Ceilings: EMT.
  - b. Indoors, Exposed: Use rigid galvanized steel conduit below ten feet above finished floor. EMT may be used above ten feet.

- c. Indoors, Below Floor Slab: (Minimum 3/4 inch size). Schedule 80 rigid non-metallic conduit. Stub up using rigid galvanized steel elbows.
  - d. Outdoors, Below Grade: (Minimum 1-inch size). Schedule 80 rigid non-metallic conduit. Stub up using rigid galvanized steel elbows. Schedule 40 rigid non-metallic conduit.
  - e. Outdoors, Exposed: Rigid galvanized steel conduit.
  - f. Flexible Steel Conduit: Use (in dry locations only) for connections to transformers, vibrating equipment, and equipment requiring minor adjustments in positions, for final connections to recessed lighting fixtures, and between outlet boxes in metal stud partitions.
  - g. Liquid-Tight Flexible Steel Conduit: Use where flexible steel conduit connections are required in damp, wet or oily locations, and for final connections to all motors and similar equipment.
2. Raceway Routing. As required by job conditions unless specific routes or dimensioned positions are indicated on the drawings. Install tight to slabs, beams and joists wherever possible. Route exposed conduit, and conduit installed above ceilings, parallel or perpendicular to walls ceilings and structural members. Install to maintain minimum headroom and to present a neat appearance. Run parallel raceways together with bends made from same center line. Verify exact locations of all raceways, pull boxes, and junction boxes. Resolve any conflicts before installation.
  3. Raceway Installation. Cut conduit ends square using saw or pipecutter and ream each cut end smooth. Carefully make all conduit bends and offsets so that the inside diameter of pipe is not reduced. Make bends so that legs are in the same plane. Make offsets so that legs are in the same plane and parallel. Protect stub-ups from damage, and carefully rebend when necessary.
  4. Fittings. Make up all raceway fittings tight so that final installation of raceway, fittings and enclosures constitutes a firm mechanical assembly and a continuous electrical conductor. Where required, provide bonding jumpers to assure electrical continuity.
  5. Protection. Protect all raceways, enclosures and equipment during construction to prevent entry of concrete, debris and other foreign matter. Free clogged conduits of all obstructions, or replace, prior to pulling wire. Do not pull wire within buildings until buildings are completely enclosed.
  6. Boxes. Install all outlet, pull and junction boxes rigidly, plumb and level. Support and secure boxes independently from conduits terminating at box. Install all boxes so as to be accessible and so that covers may be easily removed.
  7. Handholes. Provide as indicated, installed plumb and level. Where not indicated, install every 200' at a minimum.
  8. Conduit Seals. Install conduit seal for each conduit penetrating an exterior building wall below grade (unless penetration is below lowest building floor slab), and elsewhere as indicated, and so as to achieve a sealed watertight installation.
  9. Pull Strings. Provide pull strings in all spare conduits.

#### **K. Concrete Work.**

1. General. All concrete shall be prepared from approved materials and poured on clean, stable surfaces.
2. Exterior Base Surfaces. Twelve-inch layer of crushed stone over well consolidated, stable, undisturbed soil. Where the underlying soil contains excess organic material, trash or voids,

or fails to provide solid bearing for any other reason, excavate to the depth required for solid bearing and re-establish the required elevation with approved granular materials.

3. Finishing. Trowel all exposed surfaces smooth. Round-off or chamfer all exposed edges.
4. Curing. Beginning immediately after placement, protect concrete from premature drying, excessive hot or cold temperatures and mechanical injury. Maintain minimal moisture loss at relatively constant temperature throughout period necessary for hydration of cement and hardening of concrete.

#### **L. Conductors – 600 Volt and Below**

1. Minimum Conductor Size. All branch circuit wiring shall be minimum #12 AWG. All control circuit wiring shall be minimum #14 AWG, unless indicated otherwise. Provide larger sizes as indicated or required.
2. Branch Circuit Conductor Sizes. Provide branch circuit conductor sizes as indicated on the panelboard schedules, plans, or elsewhere. Neutral conductor size to match phase conductors unless indicated otherwise. Provide branch circuit switch legs and travelers as required for the switching indicated.
3. Equipment Grounding Conductor Required. For each branch circuit and feeder run, provide an equipment grounding conductor for continuous length of run, sized per NEC 250-122 (minimum), larger if so indicated.
4. Feeders. Provide feeder conductor sizes and quantities as indicated.
5. In Raceway. Install all wiring in conduit or other specified raceway, unless indicated otherwise.
6. Terminations. Furnish and install terminations, including lugs if necessary, to make all electrical connections indicated or required. Make connections and terminations for all stranded AWG conductors using crimp, clamp, or box type connectors and terminators. Enclose all strands of stranded conductors in connectors, and lugs.
7. Color. Conductors #10 and smaller shall be factory color-coded by integral pigmentation with a separate color for each phase and neutral. #8 and larger shall have stripes, bands, hash marks or color pressure-sensitive plastic tape. Color code all branch circuit and feeder conductors as follows:

- a. 208/120 Volts:

Phase	Color
A	Black
B	Red
C	Blue
Neutral	White

- b. Equipment Grounding Conductors: Green

8. Phase Arrangement. Arrange phases in all electrical equipment as follows:
  - a. A, B, C: Front to Rear
  - b. A, B, C: Top to Bottom.
  - c. A, B, C: Left to Right When Facing Established Front of Equipment.

#### **M. Equipment Connections.**

1. Connect complete, all equipment requiring electrical connections, furnished as part of this Contract or by others, unless indicated otherwise.

2. Equipment Variations. Note that equipment sizes and capacities as shown on the Contract Documents are for bidding purposes and as such may not be the exact unit actually furnished. Contractor shall anticipate minor variations in equipment and shall include in his Bid all costs required to properly connect the equipment actually furnished.
3. Verification. Obtain and review shop drawings, product data and manufacturer's instructions for equipment furnished by others. Examine actual equipment to verify proper connection locations and requirements.
4. Coordination. Sequence electrical rough-in and final connections to coordinate with installation and start-up schedule and work by other trades.
5. Rough-In. Provide all required conduit, boxes, fittings, wire, connectors and miscellaneous accessories, etc., as necessary to rough in and make final connections to all equipment requiring electrical connections. In general, motors and equipment shall be wired in conduit to a junction box (or safety switch) near the unit, and from there to the unit in flexible metal or liquid-tight flexible steel conduit.
6. Connections. Provide properly sized overload and short circuit protection for all equipment connected, whether furnished under this Contract or by others. Verify proper connections with manufacturer's published diagrams and comply with same. Verify that equipment is ready for electrical connections, wiring and energization, prior to performing same.
7. Control Wiring. Provide all control wiring to remote devices or equipment as indicated or required. Modify equipment control wiring, install or disconnect jumpers, etc., as required.

**N. Hangers and Supports.**

1. General. Rigidly support and secure all electrical materials, raceway and equipment to building structure using hangers, supports and fasteners, suitable for the use, materials and loads encountered. Provide all necessary hardware.
2. Overhead Mounting. Attach overhead mounted equipment to structural framework or supporting metal framework. Do not make attachments to steel roofing, steel flooring or ceiling mineral tile.
3. Wall Mounting. Support wall mounted equipment by masonry, concrete block, metal framing or sub-framing.
4. Exterior Walls. Mount all electrical equipment located on the interior of exterior building walls, at least one inch away from wall surface, using suitable spacers.
5. Structural Members. Do not cut, drill or weld any structural member.
6. Independent Support. Do not support electrical materials or equipment from other equipment, piping, ductwork or supports for same.
7. Temporary Conditions. Do not attach to or support electrical work from removable or knockout panels or temporary walls or partitions.
8. Raceway Supports. Rigidly support all raceway with maximum spacings per NEC, and so as to prevent distortion of alignment during pulling operation. Use approved hangers, clamps and straps for individual runs. Do not use perforated straps or tie wires. Where multiple parallel raceways are run together, use trapeze type hanger arrangement made from U-channel and accessories, suspended by threaded rods, and allow at least 25% spare capacity for future installation of additional raceways. Rigidly anchor vertical conduits serving floor-mounted or "island" type equipment mounted away from walls with metal bracket or rigid steel conduit extension secured to floor.
9. Miscellaneous Supports. Provide any additional structural support steel brackets, angles, fasteners and hardware as required to adequately support all electrical materials and equipment.

10. Seismic Restraints and Supports. Provide as indicated and/or as required per seismic zone indicated.

**O. Electrical Identification.**

1. General. Locate nameplate, marking, or other identification means on outside of equipment or box front covers when above ceilings and when in mechanical or electrical equipment rooms or other unfinished areas, and on inside of front cover when in finished rooms/areas. Use Contract Document designations for identification unless indicated otherwise.
2. Nameplates. Provide nameplate engraved with equipment designation for each safety switch, panelboard, transformer, motor starter, and all other electrical cabinets, etc.
3. Underground Warning Tape. During trench backfilling for each underground electrical line, provide a continuous underground warning tape located directly above line, at six to eight inches below finished grade.
4. Marking Pen Labeling. Mark each junction and pull box indicating source designation and circuit number(s) for the enclosed conductors.
5. Wire Tags. For power circuits, apply wire tag indicating appropriate circuit or feeder number to each conductor present in distribution panel and panelboard gutters, and to each conductor in pull and junction boxes where more than one feeder or multi-wire branch circuit is present. Where only a single feeder or multi-wire branch circuit is present, box cover labeling and conductor color coding is sufficient. For control, communications and signal circuits, apply wire tag indicating circuit or termination number at all terminations and at all intermediate locations and boxes where more than one circuit is present.
6. Panelboard Circuit Directories. At completion of project, accurately complete each panelboard circuit directory card, identifying load served or “spare” or “space” for each circuit pole. When modifying, adding or deleting circuits at an existing panelboard, update the existing (or provide new) circuit directory card to accurately reflect final conditions.

**P. Grounding.**

1. General. Provide all system and equipment grounding as indicated and as required by the NEC.
2. Equipment Grounding. Provide a green equipment grounding conductor, sized per NEC 250-122 (larger if so indicated) with each feeder and branch circuit run.
3. Provide exothermic welded connections where indicated.

**3.08 Cutting and Patching.**

- A. General.** Provide all cutting, drilling, chasing, fitting and patching necessary for accomplishing the work. This includes any and all work necessary to: uncover work to provide for the installation of ill-timed work; remove and replace defective work and work not conforming to the requirements of the Contract Documents; install equipment and materials in existing structures; in addition to that required during the normal course of construction.
- B. Building Structure.** Do not endanger the integrity of the building structure by cutting, drilling or otherwise modifying any structural member, without specific approval. Do not proceed with any structural modifications without written permission of the Project Structural Engineer.
- C. Repairs.** Repair any and all damage to work of other trades caused by cutting and patching operations, using skilled mechanics of the trades involved.

**3.09 Welding.** Where welding is required, such welding shall be performed in a skilled manner by certified welders. Verify that welds are free from cracks, craters, undercuts, and strikes, weld



splatter, and any other surface defects. Clean and re-weld any welds deemed unacceptable in size or configuration. Do not weld to structural steel without prior written permission from the Engineer.

**3.10 Factory Start-Up Service.** Start-up and warranty service shall be performed by the valve vault manufacturer. A total of two (2) days for startup services and on-site operator training shall be provided by a qualified factory-trained operator who is a regular employee of the vault manufacturer to perform the following:

1. Check and approve the installation before it is placed into service and make final adjustments as necessary.
2. Supervise the equipment start-up and initial operation.
3. Operate the system in the presence of the Engineer and demonstrate the proper operation of all equipment.
4. Instruct Owner personnel on the care and maintenance of the equipment.
5. Prepare a written report summarizing the start-up and initial operation activities.
6. Revisit the project site as often as necessary until all problems are resolved and the installation and operation are entirely satisfactory in the judgement of the Owner.

**3.11 Testing.** After the station plumbing is completed, the pressure piping within the station, including valves, control valves, fittings, connections that make up the entire system shall be hydrostatically tested at a pressure of 150 psi. The test pressure shall be applied for a minimum of 20 minutes, during which time all joints, connections and seams shall be checked for leaking. Any deficiencies found shall be repaired and the system shall be retested.

The results of this testing shall be transmitted in writing to the Engineer prior to shipment of the station and shall note test pressure, time at full pressure and be signed by the Quality Control Manager or test technician.

**3.12 Disinfection.** Disinfection shall be performed in accordance with Section 663 *Water Supply Utilities*.

**3.13 Field Quality Control.** Field testing shall be performed after installation of the equipment. The field testing shall demonstrate the following:

1. The equipment has been properly installed in accordance with manufacturer's instructions and recommendations.
2. The equipment has been installed in the specified location and orientation or as shown on the Contract Drawings.
3. The equipment operates without overheating or overloading of any parts, and without objectionable vibration.
4. There are no mechanical defects in any of the parts.

#### **4 METHOD OF MEASUREMENT**

The work will be measured on a lump sum basis for the installation of a factory built, below-grade packaged pressure reducing valve vault. The work shall include all labor, materials, equipment, and incidentals to install the vault, and furnish and install floor drain piping and pipeline connections.

#### **5 BASIS OF PAYMENT**

Payment will be made at the contract price to furnish all materials, labor and equipment necessary to satisfactorily complete the work as specified, except where specific costs are designated or included in another pay Item of work as shown on the contract plans and as specified herein:

- A. Excavation.** Excavation will be paid for under Item 206.0201 "Trench and Culvert Excavation".
- B. Crushed Stone.** The valve vault shall be placed on a minimum 12-inch foundation of crushed stone and be set at the proper elevation, carefully leveled, and aligned. Crushed stone will be paid for under Item 623.12 "Crushed Stone (In-Place Measure)".
- C. Geotextile Bedding.** Geotextile bedding shall be paid for under Item 207.20 "Geotextile Bedding".
- D. Electrical Service.** Utility electrical work performed at the station will be paid for under Item 662.60000308 "Furnishing Electrical Service"

**Payment will be made under:**

<b>Item No.</b>	<b>Item</b>	<b>Pay Unit</b>
663.10040107	Packaged Pressure Reducing Valve Vault	Lump Sum

**SPECIAL NOTE****ITEM 663.1004NN07 - RESIDENTIAL PRESSURE REDUCING VALVES****1 DESCRIPTION**

**1.01 General.** Under this item, the Contractor shall furnish and supply the Town with 20 1-inch pressure reducing valves in accordance with this specification and the contract documents.

**1.02 Submittals.** Submit the following for approval:

1. Manufacturer's data showing dimensions and materials of construction of all products specified in this section, specifications, and installation instructions.
2. Equipment, piping, and valve layout and schematic drawings.
3. Statement of compliance with ANSI/AWWA specifications.

**1.03 Quality Assurance.**

**A. Reference Standards:** Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified:

1. American Water Works Association (AWWA).
2. American National Standards Institute (ANSI).
3. American Society for Testing and Materials (ASTM).
4. National Sanitation Foundation (NSF).

**B. Requirements of Regulatory Agencies:** Valves shall conform to the specifications, regulations, and requirements of all agencies (federal, state and local), Codes, and Associations having jurisdiction governing construction, sizing, application, and location of same.

**2 MATERIALS****2.01 Pressure Reducing Valves**

**A. General.** All valves shall be certified to NSF/ANSI 61, Drinking Water System Components – Health Effects, and certified to be Lead-Free in accordance with NSF/ANSI 372. Valve shall be listed to ASSE 1003 and IAPMO and certified to CSA B356.

**B. Materials and Components.** Valve body shall be lead-free copper silicon alloy suitable for water supply pressures up to 300 psi. Valve shall be complete with integral strainer. Internal parts shall be stainless steel. Diaphragm and valve disc shall be EPDM. The seat module shall be replaceable. Valves shall have an adjustable reduced pressure range of 25-75 psi. Valves shall be set to 70 psi.

**C. Approved Manufactures.** Watts Model LF25AUB-Z, or approved equal.

**3 CONSTRUCTION**

Equipment installation shall be included under a separate pay item.

**4    METHOD OF MEASUREMENT**

Measurement shall be made for the number of residential pressure reducing valves furnished.

**5    BASIS OF PAYMENT**

The unit bid price shall include the cost to furnish and supply **20** 1-inch pressure reducing valves to the Town. Payment for labor and equipment necessary to satisfactorily complete the installation of pressure reducing valves are designated or included in another pay Item of work as specified herein:

**A. Interior Water Plumbing.** Installation will be paid for under a separate item.

*Payment will be made under:*

<b>Item No.</b>	<b>Item</b>	<b>Pay Unit</b>
663.10040107	Residential Pressure Reducing Valves	Each

**SPECIAL NOTE****ITEM 663.10050007 - BLOW-OFF HYDRANT****1 DESCRIPTION**

**1.01 General.** Under this item, the Contractor shall provide all labor, materials, equipment, and incidentals required to install a blow-off hydrant in accordance with these specifications and the contract plans.

**1.02 Submittals.** Submit the following for approval:

1. Manufacturer's data showing dimensions and materials of construction of all products specified in this section, specifications, and installation instructions.
2. Equipment, piping, and valve layout and schematic drawings.
3. Statement of compliance with ANSI/AWWA specifications.

**1.03 Quality Assurance.**

A. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified:

1. American Water Works Association (AWWA).
2. American National Standards Institute (ANSI).
3. American Society for Testing and Materials (ASTM).
4. National Sanitation Foundation (NSF).

B. Requirements of Regulatory Agencies: Valves shall conform to the specifications, regulations, and requirements of all agencies (federal, state and local), Codes, and Associations having jurisdiction governing construction, sizing, application, and location of same.

**2 MATERIALS**

**2.01 General.** All materials shall be certified to NSF/ANSI 61, Drinking Water System Components Health Effects, and certified to be Lead-Free in accordance with NSF/ANSI 372.

**2.02 Blow-off Hydrant.** Hydrants shall be non-freezing, self-draining type. The hydrants shall be furnished with a 2" FIP vertical inlet and bronze 2-1/2" NST outlet. A non-turning operating rod shall open left. Hydrants shall be serviceable from above grade with no excavation necessary, and complete with a bronze operating mechanism and an aluminum plunger design. Hydrants shall be lockable to prevent unauthorized use.

1. Approved manufacturer:
  - a. Kuperfle Foundry Co. MainGaurd #77, or approved equal.

**2.03 Piping.** Copper water pipe and fittings shall be Type K and shall conform to the requirements of ASTM B88.

**2.04 Curb Valve/Stop.** Valves shall conform to the requirements of AWWA C800. Valve body shall be brass and rated for a working pressure of 175 psi. Valve Box shall be extension type with stationary

rod and arch patter base. Lid shall be cast iron removable brass pentagon head plug. Two valve keys shall be designed to fit valve box.

- 2.05 Hydrant Paint.** All hydrants shall be painted red (including operating nut) with white top cover and nozzle caps. All hydrants shall be furnished completely shop primed and with 1 finish coat of the specified color(s). After installation, the hydrants shall receive 1 additional finish coat of the specified color(s). Both the shop finish coat and field finish coat shall be a weather-resistant, high-gloss enamel, "New Color Horizons System" by Rust-Oleum or approved equal.

### **3 CONSTRUCTION**

Equipment installation shall be in complete conformance to the manufacturer's instructions.

### **4 METHOD OF MEASUREMENT**

The quantity to be measured for payment will be the number of units installed in accordance with the contract documents. The price bid shall include the cost of all labor, materials, equipment, and incidentals to install the blow-off hydrant, piping, curb valve, valve box, and appurtenances in accordance with this specification and as shown in the contract drawings. The bid price shall include the cost of excavation for the hydrant and appurtenances and all necessary subgrade materials as recommended by the manufacturer.

### **5 BASIS OF PAYMENT**

Payment will be made at the contract price to furnish all materials, labor and equipment necessary to satisfactorily complete the work as specified, except where specific costs are designated or included in another pay Item of work as shown on the contract plans.

*Payment will be made under:*

<b>Item No.</b>	<b>Item</b>	<b>Pay Unit</b>
663.10050007	Blow-Off Hydrant	Each

**SPECIAL NOTE****ITEM 663.10060007 - AIR RELEASE VALVE ASSEMBLY****1 DESCRIPTION**

**1.01 General.** Under this item, the Contractor shall provide all labor, materials, equipment, and incidentals required to install an air release valve assembly in accordance with these specifications, the contract plans, and the standard sheets.

**1.02 Submittals.** Submit the following for approval:

1. Manufacturer's data showing dimensions and materials of construction of all products specified in this Item, specifications, and installation instructions.
2. Equipment, piping, and valve layout and schematic drawings.
3. Statement of compliance with ANSI/AWWA specifications.

**1.03 Quality Assurance.**

A. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified:

1. American Water Works Association (AWWA).
2. American National Standards Institute (ANSI).
3. American Society for Testing and Materials (ASTM).
4. National Sanitation Foundation (NSF).

B. Requirements of Regulatory Agencies: Valves shall conform to the specifications, regulations, and requirements of all agencies (federal, state and local), codes, and associations having jurisdiction governing construction, sizing, application, and location of same.

**2 MATERIALS**

**2.01 General.** All valves and piping materials shall be certified to NSF/ANSI 61, Drinking Water System Components Health Effects, and certified to be Lead-Free in accordance with NSH/ANSI 372. All valves shall conform to all applicable AWWA standards.

**2.02 Piping.** All ductile iron pipe shall be flanged conforming to the requirements of ANSI A21.15 and ANSI A21.51 and have a wall thickness Class 53. Fittings shall be cast or ductile iron conforming to ANSI/AWWA C110/A21.10. All ductile iron pipe and fittings shall be furnished with a seal coated double thickness cement mortar lining of 1/8 inches conforming to ANSI/AWWA C104/A21.4.

**A. Vent Pipe.** Plastic vent pipe and fittings shall conform to the material requirements of ASTM D1784 and shall be manufactured in accordance with ASTM 1785 and ASTM D2665 for Schedule 40 PVC pipe.

**B. Drain Pipe.** Plastic drain pipe and fittings shall conform to the material requirements of ASTM D1784 and shall be manufactured in accordance with ASTM D2241 for SDR 26 PVC pipe.

**2.03 Isolation Valves.** Ball valves shall meet or exceed ASTM Spec B124 No. C37700. The ball valves shall be 2-piece forged brass body, blow out proof stem, TFE seats, TFE packing with adjustable stem packing gland. The valves will be NPT threaded pattern complete with lever operators. Maximum working pressure shall be 600 psi.

**2.04 Combination Air/Vacuum Valve.** The valve shall fully conform to the requirements of AWWA C512 and consist of a large orifice and small orifice housed in a single body. The large orifice shall vent air during the filling of the pipeline and to admit air during draining or negative pressure conditions. The small orifice shall automatically open as often as necessary to release small amounts of accumulated air while the system is pressurized. The valve size shall be 2" with NPT body rated for 300 psi WOG. The working pressure range shall be 10-150 psi with a 1/8" small orifice.

The valve body and cover shall be cast iron and conform to ASTM A126, Class B. All internal parts shall be stainless steel and the valve seat shall be Buna-N Rubber. The stainless steel valve float shall be spherical. Drain lines from the valve shall be hard piped to the nearest floor drain.

1. Approved manufacturer:
  - a. GA Industries Model 945, or approved equal

**2.05 Surge Check Valve.** The combination air valve shall incorporate a surge check to minimize slam and possible damage during closure due to the water column. The surge check shall be normally open but designed to close during the transition from air to minimize slam and possible valve damage. It shall return to the fully open position upon closure of the combination air valve to allow air-re-entry during draining. The surge check shall be of the same size and pressure rating as the air valve, with matching end connections.

1. Approved manufacturer:
  - a. GA Industries Model 284, or approved equal

**2.06 Pressure Gauges.** Combination pressure gauge shall have a built-in pressure snubber and have 4-1/2" minimum diameter face and turret style case, black fiberglass-reinforced thermoplastic with a clear acrylic window with Buna-N gasket. The gauge shall have a 1/4" MNPT lower mount process connection and contain a 0.6mm copper alloy restrictor. Gauge range shall be 0-160 psi.

The gauge connection shall be complete with both isolating and vent valves and shall be arranged as to easily vent air and facilitate gauge removal. Gauge ranges, markings and gauge location shall be identified in the contract documents.

### **3 CONSTRUCTION**

**3.01 General.** Equipment installation shall be in complete conformance to the manufacturer's instructions.

**3.02 Site Preparation and Execution.** Excavation of the manhole shall be in accordance with Section 206 *Trench, Culvert, and Structure Excavation*. Compaction of each layer shall be in accordance with §203-3.03C *Compaction*. Backfill material at structures shall be in accordance with §203-1.01H *Suitable Material*.



- 3.03 Vent.** The manhole shall be vented to atmosphere and fitted with a stainless steel bug screen at pipe discharge.
- 3.04 Drain Pipe.** The manhole shall be drained to daylight with a slope of  $\frac{1}{4}$ " per foot and be fitted with a stainless steel screen at the pipe discharge as shown on the Drawings.
- 3.05 Pipe Connections.** Pipe connections to the manhole shall be installed true to line and grade as shown on the contract plans. Wall fittings shall be watertight, compatible with the pipe joint. Connections shall conform to the details shown on the contract plans.
- 3.06 Testing Procedures.** The pipe lines in which the valves and appurtenances to be installed are to be field tested. During these tests any defective valve or appurtenances shall be adjusted, removed and replaced, or otherwise made acceptable to the Engineer. All tests shall be submitted to the Engineer for review.

#### **4 METHOD OF MEASUREMENT**

The work will be measured on a lump sum basis and shall include all labor, materials, equipment, and incidentals to install all piping, valves, and all required appurtenances in accordance with this specification and as shown in the contract documents.

#### **5 BASIS OF PAYMENT**

Payment will be made at the contract price to furnish all materials, labor and equipment necessary to satisfactorily complete the work as specified, except where specific costs are designated or included in another pay Item of work as shown on the contract plans and as specified herein:

- A. Round Precast Manhole.** The concrete manhole shall be paid for under Item 604.4048 "Round Precast Concrete Manhole Type 48".
- B. Manhole Adjustment Rings.** Adjustment Rings shall be paid for under Item 604.10 "Prefabricated Adjustment Rings for Manholes".
- C. Excavation.** Excavation for manhole will be paid for under Item 206.0201 "Trench and Culvert Excavation".
- D. Crushed Stone.** The manhole shall be placed on a minimum 12-inch foundation of crushed stone and be set at the proper elevation, carefully leveled, and aligned. Crushed stone will be paid for under Item 623.12 "Crushed Stone (In-Place Measure)".
- E. Geotextile Bedding.** Geotextile bedding shall be paid for under Item 207.20 "Geotextile Bedding".
- F. Frame and Cover.** Manhole Frame and Cover shall be paid for under Item 655.1202 "Manhole Frame & Cover".

**SPECIAL NOTE****ITEM 663.10070007 - WATER METERS AND REMOTE READ SYSTEM****1 DESCRIPTION**

**1.01 General.** Under this item, the Contractor shall furnish, install and supply the Town with 83 water meter units and one drive-by meter reading technology in accordance with this specification and the contract documents. A single manufacturer shall supply all water metering endpoints, mobile reading software, hardware and/or cloud-based software necessary to furnish a mobile meter reading system. Supplier shall be responsible for software installation, training and data hosting of the mobile reading system. Installation of the metering endpoints is the responsibility of the Contractor. For these endpoints, the system design shall provide a migration path to fixed network, if desired at a later time, by the simple addition of gateway transceivers.

**1.02 Submittals.** Submit the following for approval:

1. Manufacturer's data showing dimensions and materials of construction of all products specified in this section, specifications, and installation instructions.
2. Statement of compliance with ANSI/AWWA specifications.

**1.03 Quality Assurance.**

- A. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified:
1. American Water Works Association (AWWA).
  2. American National Standards Institute (ANSI).
  3. American Society for Testing and Materials (ASTM).
  4. National Sanitation Foundation (NSF).
- B. Requirements of Regulatory Agencies: Meters shall conform to the specifications, regulations, and requirements of all agencies (federal, state and local), Codes, and Associations having jurisdiction governing construction, sizing, application, and location of same.

**2 MATERIALS****2.01 Ultrasonic Water Meters**

- A. **General.** All ultrasonic flowmeters shall comply with the most recent revision of ANSI/AWWA C701. All meters shall be certified to NSF/ANSI 61, Drinking Water System Components – Health Effects, and certified to be Lead-Free in accordance with NSF/ANSI 372.
- B. **Meter Size and Quantity.** The Contractor shall supply the Town with 79 1-inch, and four 1-1/2-inch water meters.
- C. **Components.** The ultrasonic meters shall feature a stainless steel, lead-free meter housing, and engineering polymer and stainless steel metering insert, a meter-control circuit board with

associated wiring, LCD, and battery. Meters shall feature a 9-digit LCD display presenting consumption, rate of flow, reverse-flow indication, and alarms.

**D. Performance.**

1. Meters shall have performance capabilities of continuous operation up to the rated maximum flow without affecting long term meter accuracy or causing undue wear.
2. All meters shall operate without leakage, damage or malfunction up to a maximum operating pressure of 175 pounds per square inch.

**E. Warranty.** All meter reading system hardware shall be provided with a 36-month hardware warranty. Software supplied with the system shall be updated and maintained as part of the annual hosting and licensing fees. Metering endpoints shall be provided with a 20-year pro-rated warranty.

**F. Approved Manufacturer.** Meters shall be manufactured by Badger E-series, or approved equal.

**2.02 Metering Analytics System.** The supplied mobile reading system shall be a two-way bubble-up mobile radio frequency (RF) reading system with the capability of automatically migrating to a high-powered fixed network following the installation of network gateway transceiver data collectors without the need to visit or reprogram the endpoint.

The mobile reading system will utilize an FCC non-licensed radio frequency band to communicate meter-reading data, tamper conditions, leak detection, no-usage, and reverse flow (when using an absolute encoder) notification. In mobile mode, the endpoint will transmit a current reading to the mobile transceiver.

The mobile reading system is comprised of an endpoint with data profiling capabilities located at the meter that transmits readings to the mobile transceiver when it is in the proximity range of the transmitted signal. The mobile reading system shall be able to process and maintain the information gathered from each endpoint in a database until synchronized with the software for billing purposes.

The hosted software will provide metering data to the utility's billing system. Additionally, the hosted system must also support fixed network and cellular endpoints allowing the utility to deploy the appropriate solution based on their specific needs and application and, specifically in the case of cellular endpoints, allowing the utility to collect hourly meter reads and event data from critical accounts without the installation of infrastructure.

**2.03 Mobile Meter Reading System.** The mobile reading system shall consist of manufacturer-hosted mobile meter reading software, a Windows-based laptop or tablet, and a mobile transceiver.

**2.04 Endpoint Performance Requirements**

**A. Endpoint Types.** The manufacturer must provide an engineered deployment design that includes a two way mobile endpoint that can transition to a traditional point-to-point fixed network deployment without the need for utility personnel to visit or reprogram the endpoint.

**B. Configurations.** Manufacturer shall provide a fully potted endpoint that can be deployed in an indoor, outdoor or submersible (pit) application. The endpoint shall be programmed in the factory and available for connectivity to a compatible encoder using industry standard protocol. The

endpoint shall also be available in an endpoint-only configuration for field splicing, or with a submersible inline connector. For mobile meter reading applications the endpoint must be designed to be installed underneath a plastic or composite pit lid or through a standard 1 7/8" hole in a plastic or composite pit lid. Suitable endpoint installation kits shall be available.

- C. Endpoint Transmission.** The endpoint radio frequency operation shall be a two-way bubble-up radio frequency transmission of the meter read information, requiring no auxiliary communication necessary to trigger the transmission. Endpoint must store a minimum of 90 days of time-synchronized hourly reading data.
- D. Wire Tamper Detection.** The endpoint must utilize a three-wire conductor cable, allowing monitoring of the integrity of its connection to the meter encoder. It will also indicate a tamper alert status within the endpoint transmission signal if either a short or open-circuit condition is sensed in the three-wire connection.
- E. Leak Detection.** To assist in the timely identification of potential leaks, the endpoint shall feature a potential leak detection algorithm. The alert notification will automatically be removed when a two-hour period with no water consumption is detected. When used with manufacturer's high resolution encoder or high resolution static meter the leak detection indicator is set by the encoder/meter and passed to the endpoint for inclusion in the standard mobile message.
- F. Reverse Flow.** The endpoint will feature a reverse flow indicator. The alert notification will automatically be removed when a two-hour period with no water consumption is detected. When used with manufacturer's high resolution encoder or high resolution static meter the leak detection indicator is set and cleared by the encoder/meter and passed to the endpoint.
- G. No Usage.** The endpoint shall report a no usage indicator when consumption has not been recorded for a period of 30 days. The indicator will automatically reset the next time consumption is measured.
- H. Interval Data.** The endpoint shall be factory programmed to store 90-days of hourly consumption readings with metering exception information in its nonvolatile memory, with an option to field reprogram the endpoint interval from hourly to 15-minute data. The historical interval data may be downloaded via RF request or IR communication and graphed in a profile analysis software program.
- I. Data Integrity.** The endpoint shall utilize secure and robust encryption to ensure that data is reliably transmitted and received, that the integrity of the data is maintained, and that data cannot be captured or altered by unauthorized users.
- J. IR Programming.** The endpoint will have infrared communication (IR) connection to aide in installation and troubleshooting. An IR Programmed indicator shall be included in the mobile message.
- K. RF Programming.** The endpoint will be capable of two-way RF communication, which allows for endpoint firmware upgrades and endpoint clock synchronization.

- L. Environmental.** The endpoint shall, at a minimum, be able to withstand temperatures between -40° F to +140°F. In addition the endpoint shall be fully potted to withstand harsh environments. Endpoints with replaceable batteries are not acceptable as they are subject to corrosion and additional failures.
- M. Migration.** A single endpoint must be able to operate in high-powered fixed network mode and a lower powered mobile mode. The migration from mobile to fixed network and back must be done automatically without any needed programming at the endpoint. Endpoint must automatically migrate from a fixed network mode back to mobile mode in the event of a network failure and back to fixed network once the network is restored. While in fixed network mode the endpoint shall also transmit a mobile message every ten seconds to allow data collection by a mobile transceiver.

## 2.05 Handheld Reading System Requirements

- A. General.** The handheld reading system shall be comprised of a handheld data collector with an integrated or external transceiver board for reading the endpoints. The handheld will operate on a Windows® Mobile platform for ease of use.
- B. Rugged Design.** The handheld will be a rugged design sealed to meet an IP67 waterproof rating of up to 3' submerged, operate in extreme temperature conditions (0°F to 140°F / -18°C to 60°C), withstand drops of 4' to concrete.
- C. Handheld Display.** The handheld will contain a color touch screen display in landscape orientation with a minimum 4" (640 x 480 pixels) display to provide information necessary for meter reading.
- D. Data Entry.** The handheld will provide a minimum 53-key alphanumeric keypad with raised keys for manual data entry. The user will be able to operate the handheld through either touch screen or keypad operation.
- E. Battery.** The handheld will utilize at least a 2500 mAh field replaceable rechargeable lithium-ion battery to prevent memory loss and to extend field life. Handheld shall include AC and DC chargers.
- F. Cradle.** A single cradle will be provided for desk mount or wall mount applications. Cradle shall support charging and data synchronization via Cat5 Ethernet cable and wired network connection.
- G. Internal Transceiver.** The handheld system shall provide a flexible solution to read manual accounts or endpoints broadcasting in the 902 – 928 MHz bandwidth.
- H. User Customizable Software.** The handheld software shall support meter reader customization including font size selection and ordering of fields displayed in the reading application.
- I. Programming and Troubleshooting.** The handheld shall utilize an external infrared data port and troubleshooting software that can be used to program, quick read and troubleshoot metering endpoints.

- J. Data Synchronization.** Meter reading records shall be automatically transferred between the utility's software and handheld meter reading software via wired or wireless network connection using a data synchronization process. Handheld shall be provided with internal WiFi receiver. When network connection is present the system shall be capable of transferring real time work assignments and meter reading data between the software and handheld meter reading system.

**2.06 Installation and Training.** The manufacturer's certified training personnel shall setup and test the software and meter reading software for the utility. Upon successful completion of the set-up, the manufacturer's certified training personnel shall provide training on endpoint installation as well as meter reading system operation, maintenance and best practices. Follow-up customized training will be available. To support a community of users, manufacturer will provide periodic web-based training on the different features of the software and meter reading software to ensure the utility and its personnel are able to enjoy all the benefits the system provides.

### 3 **CONSTRUCTION**

Equipment installation shall be included under a separate pay item.

### 4 **METHOD OF MEASUREMENT**

The work will be measured on a lump sum basis.

### 5 **BASIS OF PAYMENT**

The unit bid price shall include the cost to supply **83** meter units and complete meter reading system to the Town. Payment for labor and equipment necessary to satisfactorily complete the installation of water meters are designated or included in another pay Item of work as specified herein:

- A. Residential Water Plumbing Connection.** Installation will be paid for under a separate Item 663.10080007 "Residential Water Plumbing Connection".

*Payment will be made under:*

Item No.	Item	Pay Unit
663.10070007	Water Meters & Remote Read System	Lump Sum

**SPECIAL NOTE****ITEM 663.10080007 - RESIDENTIAL WATER PLUMBING CONNECTION****1 DESCRIPTION**

**1.01 General.** Under this item, the Contractor shall be responsible for providing 19 residential water plumbing connections at 18 separate parcels. The Contractor shall furnish all materials and labor required to provide a potable water plumbing system connection at each residence, extending from five (5) feet outside of the house into the basement, in accordance with the contract documents, this special note, and/or as ordered by the Engineer. The work associated with each connection may vary slightly based on existing conditions at each residence. It shall be the Contractor's responsibility to provide a complete system.

At each of the 19 connections, the Contractor shall connect to water service pipe installed under separate items in this contract, which extends from the curb stop located at the highway boundary to a point 5 feet from the house. All other water services shall terminate at the highway boundary as shown on the contract plans.

Under this item, the work shall include, but is not limited to:

1. Furnish and install all piping, valves, and fittings necessary to make a complete and operable water plumbing system connection to a point 5 feet outside the house.
2. Coordinating with the Homeowners specified below to inspect existing potable water supply system to determine house-specific requirements for each new potable water plumbing connection, prior to proceeding with the work.
3. Disconnection and abandonment of existing water service piping from residential wells, included cutting and capping. Once disconnected, the existing private wells shall be abandoned in accordance with NYSDEC decommissioning guide which is available as supplemental information to bidders.
4. Installation of water meters and system components in accordance and as supplied under Item 663.10070007 at each of the 19 locations specified.
5. Installation of one (1) residential pressure reducing valve in accordance and as supplied under Item 663.1004NN07 at the residence of David J. Smith at 98 Dubrey Rd, Ellenburg Depot, NY 12935. Pressure reducing valve shall be installed upstream of the water meter.
6. Provide flushing, sterilization, testing, adjusting, and commissioning of the system in accordance with this special note and Section 663.

<b>Owner</b>	<b>Property Address</b>	<b>Tax Parcel</b>
Deborah Miner & Phalon Miner	2176 Rt 374 Ellenburg Depot, NY 12935	159.-2-10.1
Dale H Winter & Barbara A Winter	2202 Rt. 374 Ellenburg Depot, NY 12935	159.-2-11
Lorrain King, Garry S. King, Gabberial L. King, Wallace D. King, Donnamarie A King-Kriss & Karlinda King L. Perry	2226 Rt. 374 Ellenburg Depot, NY 12935	159.-2-13.1
Kenneth F. Varin & Margaret M. Varin	2332 Rt. 374 Ellenburg Depot, NY 12935	159.-2-16

Dean B. Holt	2354 Rt. 374 Ellenburg Depot, NY 12935	159.-2-17.2
Steven J. Rose & Jennifer S. Rose	2376 Rt. 374 Ellenburg Depot, NY 12935	159.-2-17.41
Kenneth A. Brassard, Jr.	2364 Rt. 374 Ellenburg Depot, NY 12935	159.-2-17.42
Kim Waldron & Ronald Waldron	13 Plank Rd. Ellenburg Depot, NY 12935	159.-2-8
Geraldine R. Huntley & Nellie Chandler	2104 Rt. 374 Ellenburg Depot, NY 12935	159.-2-9
David J. Smith	98 Dubrey Rd. Ellenburg Depot, NY 12935	173.-1-18
Alton Durkee & Gertrude Durkee	2211 Rt. 374 Ellenburg Depot, NY 12935	173.-1-4
Scott Lee Langlois & Rebecca O'Connell Morrow	2038 Rt. 374 Ellenburg Depot, NY 12935	174.-1-1
Donna D. Taylor	1914 Rt. 374 Ellenburg Depot, NY 12935	174.-1-10
Benjamin King, Shirley King, Michael King, Scott King, & Sharron Trudeau	1933 Rt. 374 Ellenburg Depot, NY 12935	174.-1-24.1
Margaret E. King, Margaret M. LaPoint & Benjamin L. King	1972 Rt. 374 Ellenburg Depot, NY 12935	174.-1-6
Frederick D. Sayyeau & Sandy L. Sayyeau	2032 Rt. 374 Ellenburg Depot, NY 12935	174.-1-7.2
	2034 Rt. 374 Ellenburg Depot, NY 12935	
John LaPoint & Penni LaPoint	1960 Rt. 374 Ellenburg Depot, NY 12935	174.-1-8.2
Brett L. Smith & Brandy J. Smith	1934 Rt. 374 Ellenburg Depot, NY 12935	174.-1-9

**1.02 References.** Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified:

1. American Water Works Association (AWWA).
2. New York State Department of Health (NYSDOH).
3. American National Standards Institute (ANSI).
4. American Society for Testing and Materials (ASTM).
5. Manufacturer's Standardization Society (MSS).
6. National Sanitation Foundation (NSF).

**1.03 Submittals.** Submit the following for approval.

1. Contractor shall submit a sketch of existing piping arrangement at each residence, including existing and proposed plumbing layout for approval by Engineer prior to proceeding.
2. Manufacturer's data showing dimensions and materials of construction of all products specified in this section, specifications, and installation instructions.
3. Water samples, test results, and reports.



**1.04 Quality Assurance.** Comply with the provisions of ASME B31.9 “Building Services Piping” and the New York State Plumbing Code for materials, products, and installation. Provide listing/approval stamp, label, or other marking on piping made to specified standards.

## **2 MATERIALS**

**2.01 General.** All piping, valves, unions, and appurtenances shall be certified to NSF/ANSI 61, Drinking Water System Components – Health Effects, and certified to be Lead-Free in accordance with NSF/ANSI 372. All of the requirements of Section 663 - Water Supply Utilities apply, except as modified herein.

**2.02 System Performance Requirements.** Provide a system with the following minimum working pressure ratings, except where indicated otherwise:

1. Water Distribution Systems, Below Ground: 150 psig.
2. Water Distribution Systems, Above Ground: 125 psig.

### **2.03 Plumbing Materials**

- A. The Contractor shall be responsible for determining house-specific requirements for all materials and appurtenances necessary to make a complete water plumbing connection. All new materials shall be correspond with the Homeowners existing potable water supply system.
- B. For bidding purposes, the following interior plumbing materials can be assumed;
  1. Type K Wrought-Copper, Solder-Joint Pressure Fittings: ASME B16.22.

**2.04 Pressure Reducing Valves.** Residential pressure reducing valves shall be supplied under Item 663.1004NN07.

**2.05 Water Meters.** Residential water meters shall be supplied under Item 663.10070007.

### **2.06 Ball Valves.**

- A. **1 Inch and Smaller.** Rated for 150 psi saturated steam pressure, 600 psi WOG pressure; two-piece construction; with bronze body conforming to ASTM B 62, standard (or regular) port, chrome-plated brass ball, replaceable “Teflon” or “TFE” seats and seals, blowout proof stem, and vinyl covered steel handle. Provide solder ends for domestic hot and cold water service.
- B. **1-1/4 Inch to 2-1/2 Inch.** Rated for 150 psi saturated steam pressure, 400 psi WOG pressure; three-piece construction; with bronze body conforming to ASTM B 62, full port, stainless steel ball, replaceable “Teflon” or “TFE” seats and seals, blowout proof stem, and vinyl covered steel handle. Provide solder ends for domestic hot and cold water service

## **3 CONSTRUCTION**

### **3.01 Pipe and Fittings Applications.**

- A. **General.** Use pipe, tube, fittings, and joining methods for piping systems as specified herein.

**3.02 Buried Pipe Installation.** Excavation shall be in accordance with Section 206 *Trench, Culvert, and Structure Excavation*. Surface restoration shall be in accordance with the contract plans.

**3.03 Exposed Piping Installation.**

- A. Extend water service piping and connect to existing piping of size and in location determined in the field.
- B. Install shutoff ball valve directly inside building at water service entrance, as well as on the downstream side of the water meter (2 total).
- C. Install sleeve at service penetrations through foundation wall. Seal annular space after completion of work.
- D. Water service piping from existing residential wells shall be physically disconnected from new system, included cutting and capping. Switch over from well to Town water supply system shall occur after start up and testing of system, as well as residential water plumbing. Maximum shut down per transfer is 2 hours.

**3.04 Fittings and Valves.** Install all fittings and valves in accordance with the manufacturer's written instructions and/or as ordered by the Engineer. Install shutoff valves on inlet to each plumbing equipment item, on each supply to each plumbing fixture not having stops on supplies, and elsewhere as indicated or instructed. Locate valves for easy access and provide separate support where necessary. Install valves and unions for each fixture and item of equipment arranged to allow equipment removal without system shutdown. Unions are not required on flanged devices.

**3.05 Roughing-in for Water meter.** Install roughing-in piping and specialties for water meter installation according to manufacturer's instructions and requirements.

**3.06 Field Quality Control****A. Inspect piping as follows:**

- 1. Do not enclose, cover, or put into operation water service and plumbing pipe system until it has been inspected and approved by the authority having jurisdiction.
- 2. During progress of the installation, notify the plumbing official having jurisdiction at least 24 hours prior to time inspection must be made. Perform tests specified below in presence of the plumbing official.
  - a Roughing-In Inspection: Arrange for inspection of piping system before concealed or closed-in after system roughing-in and prior to setting fixtures.
  - b Final Inspection: Arrange for final inspection by plumbing official to observe tests specified below and to ensure compliance with requirements of plumbing code.
- 3. Reinspections: When a plumbing official finds that piping system will not pass test or inspection, make required corrections and arrange for reinspection by the plumbing official.
- 4. Reports: Prepare inspection reports signed by plumbing official.

**3.07 Hydrostatic Testing.** Hydrostatic pressure and leakage tests shall be performed in accordance with Section 663.

**3.08 Disinfection.** Flushing, disinfection and testing shall be performed in accordance with Section 663. Prepare and submit reports for purging and disinfecting activities.

**3 METHOD OF MEASUREMENT**

The quantity to be measured for payment will be the number of residential water plumbing connections made in accordance with the contract documents. The price bid shall include the cost of all labor, materials, equipment, and incidentals necessary to complete the work as required in a manner approved by the Engineer.

**4 BASIS OF PAYMENT**

Payment will be made at the contract price to furnish all materials, labor and equipment necessary to satisfactorily complete the work as specified, except where specific costs are designated or included in another pay Item of work as shown on the contract plans and as specified herein:

- A. Residential Pressure Reducing Valves.** Pressure reducing valves will be furnished under Item 663.1004NN07. The cost to install residential pressure reducing valves will be included under Item 663.10080007.
- B. Residential Water Meters and Remote Reading System.** Water meters will be furnished under Item 663.10070007. The cost to install residential water meters will be included under Item 663.10080007.
- C. Water Service Pipe.** Water service pipe extending from the highway boundary to a point five (5) feet outside of the house shall be paid for under Item 663.07zz "Polyethylene Water Service Pipe". All service pipe required to complete the plumbing connection within five (5) feet of the house shall be paid under Item 663.10080007.

*Payment will be made under:*

<b>Item No.</b>	<b>Item</b>	<b>Pay Unit</b>
663.10080007	Residential Water Plumbing Connection	Each

**SPECIAL NOTE****ITEM 683.92211208 - FIBER OPTIC CABLE – 12 FIBERS****1 DESCRIPTION**

**1.01 General.** Under this item, the Contractor shall furnish, install, and test a fiber optic communication system between the Booster Pump Station and the Hydropneumatic/Re-Chlorination Station. The work shall consist of furnishing and installing overhead single mode fiber optic cable and all required temporary and permanent mounting hardware, splice closures, and slack cable as shown in the Drawings, as recommended by the manufacturer, and/or as specified by the Engineer.

**1.02 Utility Poles.** The aerial fiber optic cable shall be supported at each of the poles specified herein, unless otherwise directed by the local utility, or Engineer.

<b>Station</b>	<b>Pole No.</b>	<b>Side</b>	<b>Remarks</b>
A156+74	NYSEG 54, VZ 520	RT	Riser Pole
D1+22	NYSEG 53, VZ 518	RT	Intermediate Pole
D3+87	NYSEG 52, VZ 518	RT	Intermediate Pole
D6+55	NYSEG 51, VZ 517	RT	Intermediate Pole
D9+16	NYSEG 50, VZ ???	RT	Intermediate Pole
D12+00	NYSEG 49, VZ 115	RT	Intermediate Pole
D14+41	NYSEG 48, VZ 514	RT	Intermediate Pole
D17+07	NYSEG 47, VZ 513	RT	Intermediate Pole
D19+66	NYSEG 46, VZ 512	LT	Intermediate Pole
D21+02	NYSEG 45, VZ 511	RT	Intermediate Pole
D21+37	NYSEG 44A, VZ 510	RT	Intermediate Pole
D22+97	NYSEG 44, VZ ???	RT	Intermediate Pole
D25+64	NYSEG 45, VZ 509	RT	Intermediate Pole
D28+28	NYSEG 42, VZ 508	RT	Intermediate Pole
D30+88	NYSEG 41, VZ 507	RT	Intermediate Pole
D33+02	NYSEG 40, VZ 506	RT	Intermediate Pole
D35+08	NYSEG 39, VZ 505	RT	Intermediate Pole
D37+14	NYSEG 38, VZ 504	RT	Intermediate Pole
D39+86	NYSEG 37, VZ 502	RT	Intermediate Pole
D42+52	NYSEG 36, VZ 501	RT	Intermediate Pole
D44+55	NYSEG 35, VZ 500	RT	Intermediate Pole
D46+59	NYSEG 34, VZ 499	RT	Intermediate Pole
D49+26	NYSEG 33, VZ 498	RT	Intermediate Pole
D52+04	NYSEG 32, VZ 497	LT	Intermediate Pole
D 53+36	NYSEG 31, VZ 496	LT	Intermediate Pole
D56+02	NYSEG 30, VZ 495	RT	Intermediate Pole
D58+67	NYSEG 29, VZ 494	RT	Intermediate Pole
D61+34	NYSEG 28, VZ 493	RT	Intermediate Pole
D63+94	NYSEG 27, VZ ???	RT	Intermediate Pole
D66+55	NYSEG 26, VZ 491	RT	Intermediate Pole
D67+90	NYSEG 25, VZ 490	RT	Intermediate Pole
NOT ON PLANS	NYSEG 24, VZ, 489	LT	Intermediate Pole

D73+00	NYSEG 23, VZ 488	LT	Intermediate Pole
D75+02	NYSEG 22, VZ 487	LT	Intermediate Pole
D76+90	NYSEG 21, VZ 486	LT	Intermediate Pole
D78+45	NYSEG 20, VZ ???	LT	Intermediate Pole
D79+95	NYSEG 19A, VZ ???	LT	Intermediate Pole
D83+38	NYSEG 19, VZ???	LT	Intermediate Pole
D85+40	NYSEG 18A, VZ ???	LT	Intermediate Pole
D87+25	NYSEG 18, VZ???	LT	Intermediate Pole
D89+69	NYSEG 17A, VZ ???	LT	Intermediate Pole
D92+05	NYSEG 17, VZ ???	LT	Intermediate Pole
D93+54	NYSEG 16, VZ ???	RT	Intermediate Pole
D94+94	NYSEG 15, VZ 478	LT	Intermediate Pole
D95+77	NYSEG 15, VZ 477	LT	Intermediate Pole
D98+30	NYSEG ??, VZ 476	LT	Intermediate Pole
D101+85	NYSEG 13, VZ 475	RT	Intermediate Pole
D104+72	NYSEG 12, VZ ???	LT	Intermediate Pole
D107+93	NYSEG 11, VZ ???	LT	Intermediate Pole
D110+47	NYSEG 10, VZ ???	LT	Riser Pole

**1.03 Submittals.** Submit the following for approval:

1. Manufacturer's data showing dimensions and materials of construction of all products specified in this section, specifications, and installation instructions.

**1.04 Quality Assurance.**

- A. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified:

1. ANSI/TIA/EIA-526

- B. Requirements of Regulatory Agencies: Conform to the specifications, regulations, and requirements of all agencies (federal, state and local), Codes, and Associations having jurisdiction governing construction, sizing, application, and location of same.

**2 MATERIALS**

- 2.01 Fiber Optic Cable.** Outdoor self-supporting aerial cable, Figure-8 Loose Tube, Gel Free Cable, 12 strand fiber, single-mode (OS2). Medium-density polyethylene jacket for protection against UV radiation, fungus and abrasion. Cable design and tested per ANSI/ICEA S-87-640.

**3 CONSTRUCTION**

- 3.01 General.** Overhead utility pole installation and routing shall be per manufacturer's guidelines and recommended procedures.

**3.02 Utility Poles.** The Contractor shall install aerial fiber optic cable from utility pole NYSEG 10 at the Booster Pump Station to utility pole NYSEG 54/VZ 520 at the Re-Chlorination/Hydropneumatic Station. The Contractor shall leave ample slack cable length at both poles to complete the fiber optic service connection into both stations as shown on the contract Drawings. The total number of utility poles where the cable shall be supported is estimated at 50, but shall be field verified.

**3.03 Testing.** Provide inspection and certified Tier 1 and Tier 2 (OTDR & OLTS) testing. Provide TIA Standard based reports. Adhere to ANSI/TIA/EIA-526.

#### **4 METHOD OF MEASUREMENT**

The unit bid per foot shall include procurement, storage, installation, and testing. The work includes all required mounting hardware, connectors, splices, terminations and ancillary equipment needed to facilitate manufacturer recommended installation. Work shall be considered complete when the length of cable between is satisfactory installed, tested, and accepted by the Engineer.

#### **5 BASIS OF PAYMENT**

Payment will be made at the contract price to furnish all materials, labor and equipment necessary to satisfactorily complete the work as specified, except where specific costs are designated or included in another pay Item of work as shown on the contract plans and as specified herein:

**A. Raceway and Service Entrance.** Connection to riser poles NYSEG 10 and NYSEG 54/VZ 520, and required slack cable at the Booster Pump Station and Hydropneumatic/Re-Chlorination station shall be paid for under this item. The required slack cable at both riser poles shall be sufficient in length to complete the service connection into both stations.

The installation of the fiber optic service connection including pole risers, raceway systems, and internal fiber optic work necessary to complete the communication system from the base of the riser poles into the stations shall be paid for under the respective packaged station item, as shown in the contract Drawings.

*Payment will be made under:*

<b>Item No.</b>	<b>Item</b>	<b>Pay Unit</b>
683.92211208	FIBER OPTIC CABLE – 12 FIBERS	FOOT

**SPECIAL NOTE****New York State Department of  
Corrections and Community Supervision “DOCCS”  
Security Requirements****PIN 7805.52  
LEDGERS CORNER – TOWN OF DANNEMORA  
WATER DISTRICT PROJECT ALONG  
NEW YORK STATE ROUTE 374**

The contractor will be required to comply with the following NYS DOCCS directives while working on property owned by DOCCS.

- Directive 2216                      Fingerprinting / Criminal History Inquiry – New Employees & Contractors
- Directive 4071                      Guidelines for Construction Projects

These directives have been made available as supplemental information to bidders.

**SPECIAL NOTE****ITEM 660.81000007 - HOLD UTILITY POLE IN PLACE**

**PIN 7805.52  
LEDGERS CORNER – TOWN OF DANNEMORA  
WATER DISTRICT PROJECT ALONG  
NEW YORK STATE ROUTE 374**

The following is a list of companies allowed to hold utility poles on the project. The contractor shall only use a company from the following list of companies:

- ELDU ENERGY SERVICES CORP
- FERGUSON ELECTRIC
- HAUGLAND GROUP
- MAXIM CONSTRUCTION SERVICES
- MICHELS CORPORATION
- NORTHLINE UTILITIES LLC
- O'CONNELL ELECTRIC CO INC
- POWER & CONSTRUCTION GROUP INC
- THREE PHASE LINE CONSTRUCTION

The contractor shall only use personnel that are qualified to hold a pole with energized conductors.



**SPECIAL NOTE****COORDINATION WITH UTILITY SCHEDULE  
PIN 7805.52  
LEDGERS CORNER – TOWN OF DANNEMORA  
WATER DISTRICT PROJECT ALONG  
NEW YORK STATE ROUTE 374**

In addition to requirements and/or explanations contained in the Standard Specifications referenced in the Contract Project "Proposal", under Sections 102-03, 102-04, 104-01, 105-06, 107-05 and 107-07, the Contractor is advised of the following:

All known public and private utility lines within or adjacent to the site of the work, are shown in the existing approximate locations on the contract plans. The Contractor is cautioned that these locations are not guaranteed; nor is there a guarantee that all utility lines in existence are shown on the plans.

The Contractor shall conduct his operations as to prevent damage to such facilities. He shall make such explorations as may be necessary to determine the dimensions and locations of lines that may be subject to damage. Notification to the various owners of facilities shall be given in accordance with Part 753 of Title 16 of the Official Compilation of Codes, Rules and Regulations of the State of New York.

The Contractor shall satisfy himself as to the exact location of utility lines and shall protect in a suitable manner, all utilities encountered in his work. The Contractor shall make good any damage to those utilities caused by his operations. If the nature of the damage is such as to endanger the satisfactory operations of the utilities and the necessary repairs are not immediately made by the Contractor, the work may be done by the respective owning companies and the cost thereof charged against the Contractor.

Prior to the commencement of construction, the Contractor shall meet with all the known public and private utility companies occupying the work site. The contractor shall, at this meeting, inform the utility companies of his schedule of operations and also coordinate his work with these companies.

The contractor specifically agrees that any additional costs to do the work under this contract (due to the fact that the contractor may not have a clear site for work is included in the unit prices and lump sum prices bid for the various items of the contract. The Contractor must be aware that all areas may not be available to begin construction until relocation of utilities is accomplished.

Also, the Contractor must be aware that during excavation operations, drainage installations, etc., interference may occur with existing facilities until required relocation or adjustment of existing utility facilities is completed. Therefore, the Contractor's bid price should include any special equipment required to accomplish the above mentioned operations.

It must be recognized that all utility companies cannot work at the same time, and that scheduling cooperation between the utility companies and the Contractor is essential. The Contractor must coordinate his schedule of operations with the various utility owners involved with the project and shall verify utility information found in the contract documents.

The Verizon NY Inc. has solely owned utility poles on the project that need to be held in place by Verizon.

**SPECIAL NOTE**

Utility work required by Verizon in connection with the project includes:

**VERIZON NY INC. – REF #1B**

Verizon NY Inc. has utility poles throughout the project that need to be held in place as shown on the contract plans.

Verizon NY Inc. shall be notified **four (4) weeks** in advance of when the contractor needs the utility poles held.

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The above mentioned time periods do not apply to any corrective work to repair damage done by the Contractor to existing utility facilities, and the repairs may require time, beyond those time periods mentioned above.

In addition to the above itemized revisions, other relocations may become necessary during the construction phase as a result of more precise location data or field changes that may develop. These relocations are to be performed by the utility company involved, with coordination by the Contractor, and may require more time than previously mentioned.

Suitable time frames for these additions shall be coordinated between the contractor and the utility companies. Such time frames are not to be included within previously established time frames.

The Contractor and utility companies are directed to copy the project Engineer-in-Charge on all written notifications to other utility facility owners.

The following is a list of contacts for the affected utility companies:

**Jeff Williams**  
**Verizon**  
**11 Wards Lane**  
**Menands, NY 12204**  
**(518) 471-6414**  
[jeffrey.p.williams@verizon.com](mailto:jeffrey.p.williams@verizon.com)

**Jeffrey Schleier**  
**Verizon**  
**11 Wards Lane**  
**Menands, NY 12204**  
**(518) 471-2142**  
[jeffrey.e.schleier@verizon.com](mailto:jeffrey.e.schleier@verizon.com)

**SPECIAL NOTE****ITEM 660.61000325 – REIMBURSEMENT TO VERIZON FOR  
FURNISHING UTILITY SERVICE****ITEM 660.61000925 – REIMBURSEMENT TO NYSEG FOR FURNISHING  
UTILITY SERVICE**

These items will be used to pay for any “MAKE READY WORK” required to place fiber optic cable on the existing utility poles between the pump station and re-chlorination station. “MAKE READY WORK” is defined as adjustments made by NYSEG and Verizon to their existing utility facilities that are required to avoid violations of utility safety codes in preparation of installing fiber optic cable.

The contractor shall coordinate with NYSEG and Verizon before the fiber optic cable for the communication system between the pump station and the re-chlorination station is installed.

**SPECIAL NOTE**

**STORMWATER POLLUTION PREVENTION PLAN (SWPPP)  
MADE PURSUANT TO THE STATE POLLUTANT DISCHARGE ELIMINATION SYSTEM  
(SPDES) STORMWATER GENERAL PERMIT FOR STORMWATER DISCHARGES FROM  
CONSTRUCTION ACTIVITY  
(Permit No. GP 0-15-002)**

PIN: 780552

Project Name: NYS Routes 374 – Dannemora Water District #3  
Town of Dannemora, Clinton Co.

Project Description: Water District

A Stormwater Pollution Prevention Plan (SWPPP) has been prepared for this project. The following plan sheets, specifications, state and federal permits/approvals are components of the Stormwater Pollution Prevention Plan *(list)*:

Plans: Drawing No. GNN - 2 & 3  
Drawing No. GNT - 1

Specifications: 207.21 – Geotextile Separation  
209.1003 – Seed and Mulch - Temporary  
209.110102 – Check Dam (Ditch Bottom Width >3' to 6'), Stone-Temporary  
209.110104 - Check Dam (Ditch Bottom Width >10'), Stone-Temporary  
209.13 - Silt Fence-Temporary  
209.190201 - Rolled Erosion Control Product, Class II Type B, Intermediate  
607.41010010. – Temporary Plastic Barrier Fence  
610.1401 – Topsoil – Reuse On-site Materials  
610.1601 – Turf Establishment - Roadside

Permits/Approvals: USACE Nationwide Permit # 12  
NYSDEC SPDES-NOI – GP-0-10-001 Permit  
NYSDEC Water Quality Certification

Additional Information (*check all that apply*):

- X Soils Description
- X Description of Pollution Prevention Measures
- X Description of Temporary & Permanent E&SC & Stormwater Practices
- X Hydrologic/Hydraulic Analyses (including comparison of pre-development vs. post-development runoff conditions)
- X E&S C Construction Sequencing Plan
- X Certification Form(s)
- ☐ Operations & Maintenance Requirements

**SPECIAL NOTE****STORMWATER POLLUTION PREVENTION PLAN (SWPPP)  
(Permit No. GP 0-15-002)****Contractors' Obligations under SPDES General Permit GP-0-15-002**

Every Contractor and Subcontractor that performs an activity that disturbs or exposes soil or implements a portion of the Stormwater Pollution Prevention Plan is required, under the terms of the SPDES General Permit GP 0-15-002, to complete and sign the Contractor/Subcontractor SPDES Permit Certification (Form CONR 5). Contractors are responsible for securing applicable Subcontractor signatures and should consider obtaining certifications as part of the Subcontractor approval process.

**A blank copy of the CONR 5 is included in this proposal** and is also available in electronic format from the NYSDOT Construction Division website at [www.dot.state.ny.us/constr/constr\\_home.html](http://www.dot.state.ny.us/constr/constr_home.html).

The Contractor shall provide a signed certification for itself at the Preconstruction Meeting. The Contractor will not be allowed to begin work until the certification has been submitted to the Engineer. All subcontractors shall submit a signed copy of the CONR 5 with the subcontractor approval package. Subcontractors will not be approved without a signed certification.

**Contractor / Subcontractor SPDES Permit Certification**

Contract No.: D263340 PIN: 7805.52  
**Installation of water main along Route 374 for approximately 5.3 miles, and installation of associated equipment.**  
 Description: \_\_\_\_\_  
 Town, Village, City: Dannemora  
 County: CLINTON  
 Check Applicable Box: ☐ Prime Contractor ☐ Subcontractor

Name of Contractor/  
 Subcontractor: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 City: \_\_\_\_\_ State: \_\_\_\_\_ ZIP: \_\_\_\_\_  
 Phone: \_\_\_\_\_ Fax: \_\_\_\_\_

Core Pay Item Groups for which the Contractor/Subcontractor will be responsible (e.g. 203, 207, 209, etc.): \_\_\_\_\_

**Mandatory Certification:** The SPDES General Permit for Stormwater Discharges from Construction Activities requires the Prime Contractor and subcontractors to certify they understand the Stormwater Pollution Prevention Plan (SWPPP), the General Permit conditions, and their responsibilities for compliance. The certification must be signed prior to performing any contract work. The certification shall be signed by an Owner, Principal, President, Secretary or Treasurer of the firm in accordance with the signature requirements of 102-05 *Proposal Submission* of the Standard Specifications.

*I hereby certify that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the qualified inspector during a site inspection. I also understand that the owner or operator must comply with the terms and conditions of the New York State Pollutant Discharge Elimination System (SPDES) general permit for storm-water discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings."*

Signature: \_\_\_\_\_ Date: \_\_\_\_\_  
 Name: \_\_\_\_\_ Title: \_\_\_\_\_

**Required Training:** Effective April 30, 2010, the SPDES General Permit also requires the Prime Contractor and all subcontractors **performing earthwork or soil-disturbing activities** to identify at least one trained individual **from each company** who will be responsible for implementing the SWPPP and who shall be on-site on a daily basis when the company is performing soil disturbance activities. These activities include clearing, grubbing, grading, filling, excavation, stockpiling, demolition, landscaping, and installation and maintenance of Erosion & Sediment Control practices. Training must consist of 4 hours of NYSDEC-endorsed Erosion & Sediment Control Training every 3 years. (Training is not required if the individual is a licensed Professional Engineer, registered licensed Landscape Architect, or CPESC.) Provide the information below for trained individuals who will be on-site and responsible for SWPPP implementation on this Contract (attach a separate sheet if needed for additional Trained Individuals):

Trained Individual Name/Title : \_\_\_\_\_  
 Name of Training Course: \_\_\_\_\_  
 Trainee Number: \_\_\_\_\_ Date of Training: \_\_\_\_\_  
 Trained Individual Name/Title : \_\_\_\_\_  
 Name of Training Course: \_\_\_\_\_  
 Trainee Number: \_\_\_\_\_ Date of Training: \_\_\_\_\_

CONR 5-7  
(08/09)

**SPECIAL NOTE**  
**NYS DOT Owner SPDES Permit Certification**

Contract No. D263340PIN: 7805.52

Project Description: Installation of water main along Route 374 for approximately 5.3 miles, and installation of associated equipment.

Town: DannemoraVillage, Hamlet, City: N/ACounty: Clinton Co.

**Mandatory Notice of Intent Certification:** The SPDES General Permit for Stormwater Discharges from Construction Activities (Permit No. GP-0-15-002) requires the Owner having responsibility for the overall facility operation to certify in writing, authorization of contract implementation of the Stormwater Pollution Prevention Plan (SWPPP) as part of the construction activities. This authorization certifies the owner understands the General Permit conditions, and their responsibilities for compliance. This certification must be signed prior to performing any contract work. The certification shall be signed by a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency. For this purpose, the New York State Department of Transportation designee shall be the Regional Director.

*"I hereby authorize contract implementation of the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the qualified inspector during a site inspection. I also understand that as the owner, we must comply with the terms and conditions of the New York State Pollutant Discharge Elimination System (SPDES) general permit for storm- water discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings."*

Signature: Steve KokkorisDate: 9/29/2016Name: Steve Kokkoris, P.E.Title: Regional Director

All SPDES site inspections are to be performed by a qualified inspector per GP-0-15-002.

Effective April 30, 2010, the SPDES General Permit also requires the Prime Contractor to identify at least one trained individual who will be responsible for implementing the SWPPP and who shall be on-site on a daily basis when soil disturbance activities are being performed. (Prior training is not required if the trained individual is a licensed Professional Engineer, licensed Landscape Architect, or CPESC.)

The name, title and training information of the individual who will be on-site and responsible for SWPPP implementation on this Contract shall be submitted as part of the CONR-5.

D263340  
**SPDES STORMWATER POLLUTION PREVENTION PLAN  
(SWPPP) REVISION**

Clear Form

JOB STAMP

Date: \_\_\_\_\_

Day of Week: 

S	M	T	W	T	F	S
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Sheet No. \_\_\_\_ of \_\_\_\_

This form is to be used when revisions to the current Stormwater Pollution Prevention Plan (SWPPP) are required by SPDES General Permit for Stormwater Discharges from Construction Activity. The completed form must be filed in the Engineer's Field Office.

**Reason for the Revision(s):**      Revision(s) were requested by NYSDEC:      ☐ Yes      ☐ No

**Describe the Revision(s) to the SWPPP:**

Engineer-in-Charge Signature: \_\_\_\_\_

EICs Name & Title: \_\_\_\_\_

Date  
Completed: \_\_\_\_\_

Make Form Read-Only (Cannot be undone)

Print Form

Copy to  
Contractor: \_\_\_\_\_



☒ English

☐ Metric

## NOTICE TO DISTURB GREATER THAN 5 ACRES OF SOIL

### SPDES General Permit for Stormwater Discharges from Construction Activity

Part II.C.3 of the SPDES General Permit for Stormwater Discharges from Construction Activity, requires written authorization from the New York State Department of Environmental Conservation (NYSDEC) prior to disturbing more than 5 AC of soil. Executive management at the New York State Department of Transportation (NYSDOT) and NYSDEC have mutually agreed that prior authorization is not required for NYSDOT contracts, provided adequate control measures are implemented and site inspections are conducted in accordance with the SPDES General Permit. The NYSDOT hereby notifies NYSDEC that more than 5 AC of soil will be disturbed at this site.

A Qualified Inspector will conduct at least 2 site inspections every 7 calendar days whenever more than 5 AC of soil has been disturbed. Inspections during this period will be separated by a minimum of 2 full calendar days.

This notification will be filed with the Stormwater Pollution Prevention Plan (SWPPP).

Contract No.: \_\_\_\_\_ PIN: \_\_\_\_\_

**Installation of water main along Route 374 for approximately 5.3 miles,  
and installation of associated equipment.**

Description: \_\_\_\_\_

Town, Village, City: Dannemora

County: CLINTON

Approximate date soil disturbance  
will exceed 5 AC : \_\_\_\_\_

Total soil disturbance: \_\_\_\_\_

Signature \_\_\_\_\_

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Phone: \_\_\_\_\_

E-Mail: \_\_\_\_\_

Date Submitted to NYSDEC: \_\_\_\_\_

**NOTICE TO REDUCE FREQUENCY OF SPDES SITE INSPECTIONS**  
**SPDES General Permit for Stormwater Discharges from Construction Activity**

In accordance with Part IV.C.2.c of the SPDES General Permit for Stormwater Discharges from Construction Activity, the New York State Department of Transportation hereby notifies the New York State Department of Environmental Conservation that work on this Contract will be temporarily suspended and temporary stabilization measures have been applied to all disturbed areas.

A Qualified Inspector will conduct a site inspection at least once every 30 calendar days during this period. The standard site inspection frequency will resume when construction activities recommence.

Contract No.: \_\_\_\_\_ PIN: \_\_\_\_\_

Description: **Installation of water main along Route 374 for approximately 5.3 miles,  
and installation of associated equipment.**

Town, Village, City: **Dannemora**

County: **CLINTON**

Reason for temporary suspension of work:

☐ Winter Shutdown

☐ Other \_\_\_\_\_

Approximate date work will be suspended: \_\_\_\_\_

Approximate date work will resume: \_\_\_\_\_

Signature \_\_\_\_\_

Name: \_\_\_\_\_

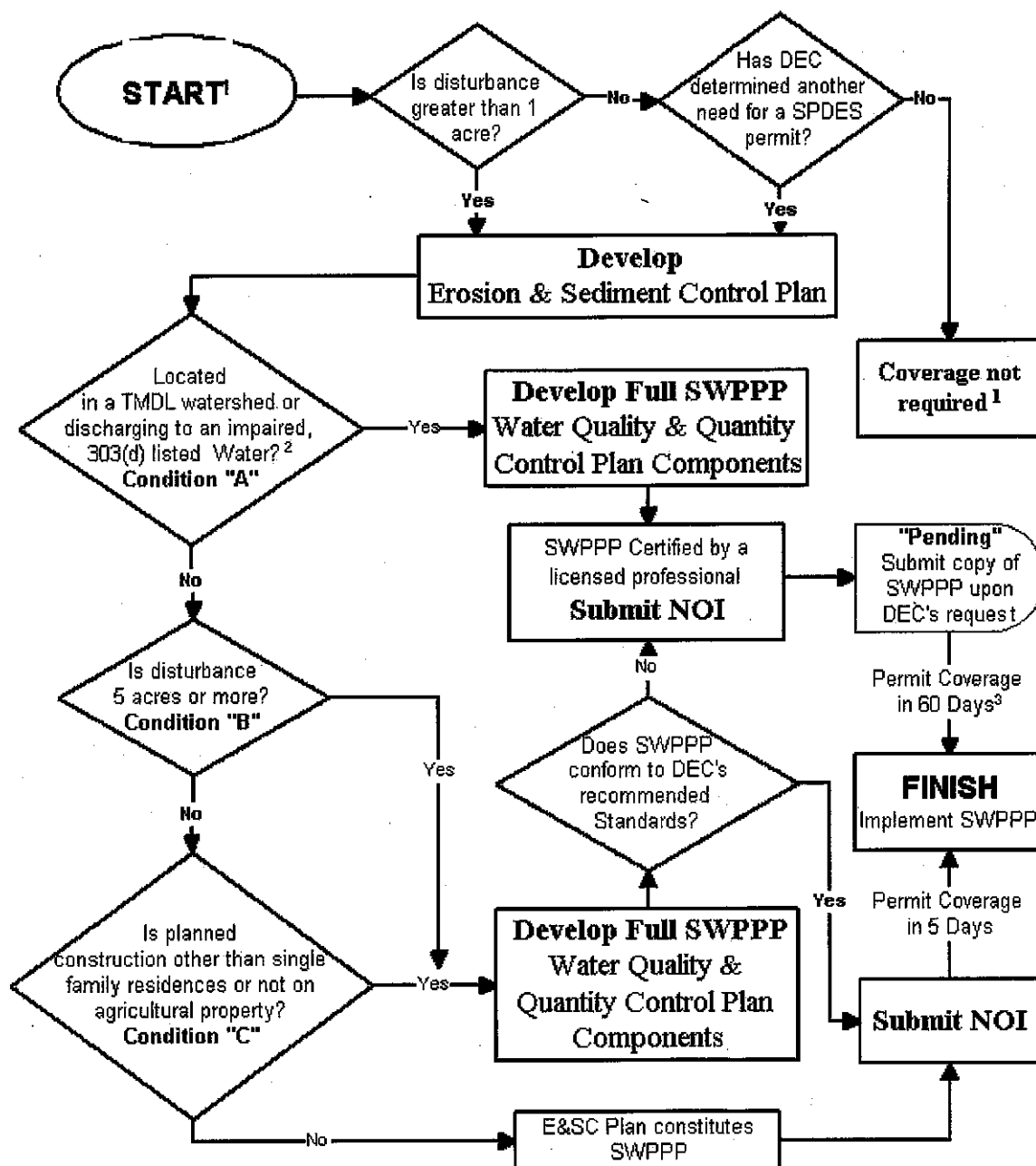
Title: \_\_\_\_\_

Phone: \_\_\_\_\_

E-Mail: \_\_\_\_\_

Date Submitted to NYSDEC: \_\_\_\_\_

## SWPPP and Stormwater Permit Process



## NOTES:

1. Under any of the above conditions other environmental permits may be required. DEC may require permit for construction disturbance < 1 acre on a case by case basis.
2. and the following exists: construction and/or stormwater discharges from the construction or post-construction site contain the pollutant of concern identified in the TMDL or 303(d) listing.
3. After receipt by DEC of completed application.

Figure 1- Stormwater Pollution Prevention Plan Component Flow Chart

**Special Note**  
**Adirondack Park Agency Project Permit**

The New York State Department of Transportation pursuant to section 814 of the Adirondack Park Agency (APA) Act, 9 NYCRR 4.150, 9 NYCRR part 577 and Executive Order 150 has secured an **APA Project Permit and Order** for this project. Detailed construction conditions are explained within the permit documents available as supplemental information to bidders. ***This note is intended to highlight areas of concern for the contractor and shall not be considered a permit summary.***

**Wetlands**

Wetlands boundaries shown on the plans have been delineated using on and offsite methodology in consultation with the APA resource staff. Avoidance of impacts to wetland resources has been and will always be a high priority.

**General**

The contractor is advised that additional permits may be required from the APA for the following work locations:

- Engineers Office
- Contractor's staging and storage
- Surplus material and borrow locations
- Waste disposal

The contractor shall be responsible for obtaining all applicable approvals and/or permits for alternative work locations not shown in the contract documents as pre-approved. Delays to the Contractor's operations due to lack of approvals or permits for additional locations not shown in the contract documents shall be the responsibility of the contractor and not be a justifiable reason for extension of time under Section 108-04 of the Standard Specifications. For the purposes of this project, there are no pre-approved waste disposal locations identified. Additional permits may be required if the contractor decides to dispose of all waste generated as a result of the project within the Adirondack Park Agency jurisdiction.

**Surplus Material Disposal**

As noted above, for the purposes of this project there are no pre approved surplus material disposal locations identified on the project plans or in the project proposal. The contractor is advised that any surplus material disposal locations need to provide for the protection and restoration of property and the landscape shall be in accordance with section 107-08 of the NYSDOT standard specifications.

The APA has determined that disposal of uncontaminated waste materials resulting from construction activities from Department projects is considered "disposal of other wastes". As such it is a "regulated activity" subject to APA jurisdictional review and permitting within APA regulated areas.

Prior to applying to the APA for any permit application for waste disposal, the Contractor must field review the proposed disposal site(s) with the Department staff to determine the suitability of the site(s) and to assess the presence of wetlands. Department staff will review the draft application materials with the Contractor to determine whether all of the required information is being provided, prior to the Contractor submitting the application to the APA. The Department will provide a letter to APA stating it has reviewed the contractor's proposed waste disposal plan and finds it environmentally sound and acceptable to the Department. The Department will also review the completed disposal site to determine whether it has been properly undertaken and stabilized.

As a minimum, prior to contacting the APA staff , the contractor should be able to provide the following proposed site information; the Town or Village, property owners name, property parcel numbers, land use classification, wetland determination and disposal waste volume.

**Truck and Equipment Cleaning**

All earth moving equipment, including but not limited to excavators and dump trucks, shall be clean prior to being brought on site. Per Section 107-01 of the Standard NYSDOT Specifications, during construction, the contractor shall thoroughly clean all construction equipment and vehicles operating in any invasive plant areas prior to moving to non-invasive locations. The intent is to insure that invasive plant species are not spread within or out of the construction site. The cost of washing equipment shall be included in the bid price for the associated earthwork items.

APA Jurisdictional inquiries should be directed to:

**Mr. Tom Saehrig**, Environmental Program Specialist  
Adirondack Park Agency  
P. O. Box 99,  
Ray Brook, N.Y.12977  
(518) 891 – 4050

**SPECIAL NOTE****TESTING AND DISINFECTING****TESTING**

All pressure pipelines shall be tested in accordance with AWWA Standard C600. The following procedure shall also be required:

Relieve trapped air at the section high points through hydrants, or taps installed for this purpose, provided temporary installations are removed and plugged after acceptance. All newly installed pipe or any valved section thereof, shall be subjected to a hydrostatic pressure 1.5 times the working pressure of the pipe at any point on the section being tested, but in no case less than 150 psi for a period of two hours. A leakage test shall be conducted concurrently with the pressure test.

The maximum allowed leakage is determined by the following formula:

$$L = \frac{N * D * P^{1/2}}{7400}$$

*Where L = allowable leakage, in gph*

*Where N = No. of joints in test section*

*Where D = nominal pipe diameter, in inches*

*Where P = average test pressure, in psig*

The Contractor shall accomplish the required tests on the pipeline by individually testing each component section of the installed main. All water for tests will be furnished and disposed of by the Contractor at his expense. The source and/or quality of water which the Contractor proposes to use in testing the lines shall be potable water acceptable to the Engineer.

If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.

Acceptance of Installation: Acceptance shall be determined on the basis of allowable leakage. If any test of laid pipe discloses leakage greater than that specified, the Contractor shall, at his own expense, locate and make approved repairs as necessary until the leakage is within the specified allowance.

All visible leaks are to be repaired, regardless of the amount of leakage.

## DISINFECTION

All pipes and fittings connected to and forming part of a potable water supply shall be sterilized in full accordance with both the requirements of AWWA Standard C651 for Disinfecting Water Mains and the New York State Department of Health, except that placement of chlorine powder or tablets inside the pipe during installation shall not be allowed, and shall be acceptable to the Engineer. Disinfect water mains after the piping has passed the pressure and leakage testing.

Flush the pipe with water at a minimum velocity of 2.5 feet per second (fps) to clear all foreign material from the pipe.

All new piping shall be filled with a chlorine solution with a concentration between 50 parts per million (ppm) and 100 ppm. The chlorine solution shall remain in the piping for a minimum of 24 hours. During this time all valves in the section treated shall be operated in order to disinfect the appurtenances. At the end of this 24 hour period, the treated water shall contain no less than 25 ppm available chlorine through the length of the main. Repeat the entire procedure if the residual is less than 25 ppm.

Sterilization tests shall be repeated as often as necessary until the minimum residual chlorine content of 25 ppm has been reached. The chlorine solution shall be thoroughly flushed out prior to placing the new sections of main in service. The Contractor is cautioned that the spent chlorine solution must be disposed of in a manner acceptable to the Engineer, in an area where its effect will not be detrimental to animal, plant or fish life.

After final flushing and before the water main is placed in service, the Contractor shall collect bacteriological samples (both coliform and heterotrophic plate count) and submit samples to an approved testing laboratory. Two consecutive sets of samples shall be taken at least 24 hours apart in accordance with AWWA C651. The collection points shall be as directed by the Engineer and local authority having jurisdiction.

- a. The testing laboratory performing the bacteriological analysis shall be acceptable to the Engineer.
- b. Submit 3 copies of the laboratory analysis to the Engineer.
- c. Should safe results not occur after laboratory tests, the Contractor shall, at his expense, repeat the disinfection procedure until safe results are obtained. This includes a positive result for coliform or a measured heterotrophic plate count of greater than 500 colony-forming units per ML.
- d. Contractor shall pay for all testing required.

After approval of the tests by the Engineer and Health Department, the Contractor shall connect the pipe to the existing waterline under the supervision of the Engineer and a representative of the local Water Department.

## Special Note

### U.S. Army Corps of Engineers - Nationwide Permit

*This note is intended to highlight the regulatory permit location for the contractor to review the conditions of work as part of the U.S. Army Corps of Engineers (USACE) Nationwide Permit Program.*

This note is to inform the contractor that, the project work is a permitted activity under the jurisdiction of the USACE. The regulatory authority of the USACE is based on the following statutes:

Section 10 of the Rivers and Harbor Act of 1899 (33 USC 403) requires a permit from USACE for any structure or work that takes place in, under, or over a navigable water or their adjacent wetlands.

Section 404 of the Clean Water Act (33 U.S.C. 1344) prohibits the discharge of dredged or fill materials into waters of the United States without a permit from the Corps of Engineers.

Work authorized under Section 404 also requires action by the New York State Department of Environmental Conservation (DEC) under Section 401 of the Clean Water Act (33 U.S.C. 1341) which prohibits the discharge of dredged or fill materials into waters of the United States without a certification from the State that such activity will not result in a contravention of water quality standards.

The appropriate USACE New York District Regional office is in Watervliet, N.Y.

New York State Department of Transportation environmental staff have reviewed the proposed activities and determined that the scope of work falls within the definition of a minor activity under the USACE regulatory permit program. The proposed work is authorized under the terms and conditions set forth under **Nationwide Permit #12 (Utility Line Activities)**, **Additional authorization**, from the USACE, **is not necessary to proceed with the planned work.**

The complete Nationwide Permit language and New York conditions are available at the USACE website link:

<http://www.nan.usace.army.mil/Missions/Regulatory/Nationwide-Permits/>

USACE District specific conditions are also part of the permit package along with the Blanket Water Quality Certification conditions from the DEC and The New York State Department of State.

**Design adherence to the Nationwide Permit Conditions has been incorporated into the project and must be followed to maintain permit compliance.**



[illegible]

03750  
L05/07/09

Page 1 of 1

**ITEM 607.41010010 - TEMPORARY PLASTIC BARRIER FENCE****DESCRIPTION**

This work shall consist of furnishing, installing, and maintaining Temporary Plastic Barrier Fences of the type and at the locations shown in the plans or where directed by the Engineer.

**MATERIALS**

Materials for Temporary Plastic Barrier Fences shall meet the following requirements:

- **Fence:** High-density polyethylene mesh, ultraviolet-stabilized min. 2 years; minimum height 4.0 feet. Color: high-visibility orange or green. When used to protect trees or other vegetation, color shall be high-visibility orange.
- **Posts:** Rigid metal or wood posts, minimum length 6.0 feet.
- **Ties:** Steel wire, #14 gauge or nylon cable ties.
- **Warning signs:** Sheet metal, plastic or other rigid, waterproof material, 1.5 feet by 2.0 feet with 4 inch black letters on a white background. Text shall be: "Protected Site - Keep Out" unless otherwise specified.

**CONSTRUCTION DETAILS**

Fences shall be erected prior to moving construction equipment onto any area designated for protection.

The line of fences as indicated on the plans shall be staked or marked out on the ground by the Contractor and approved by the Engineer before any fence is installed. Where used for protection of individual trees, fence shall be placed at the drip line (extent of canopy). If not possible, placement shall be as close to the drip line as possible and in no case less than 5.0 feet away from the tree trunk.

On approval of the stakeout, posts shall be securely driven on 6.0 foot-maximum centers, normal to the ground, to a depth 1/3 of the total post length. Plastic barrier fence shall be placed along the side of all posts. Ends of fencing segments shall overlap a distance of at least one half the fence height.

Fencing shall be secured to posts with wire or cable ties at top, middle and bottom of post. Fastener shall be tight enough to prevent the fencing from slipping down. Overlaps shall also be securely fastened.

Barrier fence which is not orange in color shall be flagged at 6.0 foot intervals with red or orange florescent tape. Warning signs shall be mounted on the fence at no more than 100 foot intervals.

Maintenance shall commence immediately after erection of the fence and continue until one week prior to acceptance of the contract, and shall consist of: replacing damaged post(s) and fencing; re-fastening and tightening fencing; and restoring fence to its intended height.

Fencing used for tree or other vegetation protection shall not be temporarily removed to allow equipment access over a protected area, except as required for items of work specifically shown on the plans and approved by the Engineer in writing.

**ITEM 607.41010010 - TEMPORARY PLASTIC BARRIER FENCE****METHOD OF MEASUREMENT**

The quantity to be measured for payment will be the number of feet of Temporary Plastic Barrier Fence erected, measured along the top, to the nearest whole foot.

**BASIS OF PAYMENT**

The unit price bid shall include the cost of all labor, materials and equipment necessary to satisfactorily complete the work. Relocation of a fence from one location to another as directed by the Engineer shall be considered as a new location and will be separately paid.

Seventy percent (70%) of the price bid will be paid after satisfactory installation of the fence. The remaining Thirty percent (30%) will be paid after complete removal of the fence.

**ITEM 617.01010024 – CONTROLLING INVASIVE PLANT SPECIES WITH  
HERBICIDES****ITEM 617.01020024 – CONTROLLING INVASIVE PLANT SPECIES BY PULLING****ITEM 617.01030024 – CONTROLLING INVASIVE PLANT SPECIES BY EXCAVATION****ITEM 617.10000024 – DISPOSAL OF MATERIAL CONTAINING INVASIVE PLANT  
SPECIES****ITEM 617.11000024 – EQUIPMENT CLEANING FOR INVASIVE PLANT SPECIES**

**DESCRIPTION.** This work shall consist of control and disposal of identified invasive species and disposal of infested soil in accordance with the contract documents and as directed by the Engineer. The work described is to control the spread and/or re-growth of invasive species. Specific control methods to be used are identified in the Special Note entitled *Controlling Invasive Plant Species*.

**MATERIALS.**

Herbicide: EPA/NYSDEC Label-approved herbicide conforming to §713-13 *Pesticides*. Surfactants added to increase the effectiveness of the herbicide may be used, in accordance with manufacturers' labels. Tracer dye shall be used in herbicide mixes to aid in identifying application coverage. Additional permitting from regulatory agencies may be required prior to application.

**CONSTRUCTION DETAILS.**

The work shall be performed in accordance with the requirements of Special Note entitled *Controlling Invasive Plant Species*.

**Site Preparation.** Refer to the Special Note for specific control methods of targeted invasive species.

**Controlling Invasive Plant Species.** Three methods are described:

**1. Pulling.**

- a. Contractor shall hand-pull, or remove using hand tools, all stems and associated roots within the designated areas shown in the contract documents at the times specified.
- b. All plant parts shall be carefully placed in black plastic bags (4 mil minimum) and securely tied or sealed.
- c. Care shall be taken in pulling stems to remove as much of the root mass as possible.
- d. Supplemental digging using hand tools to remove roots/ rhizomes or herbicide treatment may be required. Refer to the Special Note entitled *Controlling Invasive Plant Species*.
- e. Plant material shall be treated and/or transported in accordance with *Disposal of Material*.

**2. Excavation.**

- a. Mechanical methods may be used to remove plant material.
- b. Removal perimeter shall extend no less than 16 ft beyond the leading edge of

**ITEM 617.01010024 – CONTROLLING INVASIVE PLANT SPECIES WITH  
HERBICIDES**

**ITEM 617.01020024 – CONTROLLING INVASIVE PLANT SPECIES BY PULLING**

**ITEM 617.01030024 – CONTROLLING INVASIVE PLANT SPECIES BY EXCAVATION**

**ITEM 617.10000024 – DISPOSAL OF MATERIAL CONTAINING INVASIVE PLANT  
SPECIES**

**ITEM 617.11000024 – EQUIPMENT CLEANING FOR INVASIVE PLANT SPECIES**

invasive species stand.

- c. Excavation shall extend to a minimum depth of 6 ft below proposed final grade.
- d. Excavated area shall be backfilled with uncontaminated suitable material.
- e. Excavated material shall be treated and/or transported according to *Disposal of Material*.

**3. Herbicide Application.**

- a. The herbicide applicator shall be a NYSDEC Certified Commercial Pesticide Applicator. In planning the use of herbicides to control invasive species, the Contractor and Certified Pesticide Applicator shall ensure that herbicides used are labeled for the target species- through the pesticide label or through the unlabeled pest process.
- b. Herbicide shall be applied by hand-sprayer, back-pack, wick application, stem injection or herbicide clippers.
- c. Site preparation for herbicide application shall include cutting dormant stalks and actively growing plants approximately 4 weeks prior to first annual treatment.
- d. Contractor shall be responsible for all public notification and posting requirements.

**Disposal of Material.** Cut plant material shall be placed in (4 mil minimum thickness) black plastic bags for transportation out of the area. Bags shall be securely tied or sealed. Soil containing seeds, roots and/or rhizomes shall be wrapped in black plastic sheeting (4 mil minimum thickness) and transported in a manner which prevents the spread of the contaminated material during transport. Acceptable disposal methods can be one of the following:

- *Bury* - Soil containing invasive plant material shall be buried either in an excavated pit or fill section, covered with at least 6 ft of uncontaminated fill material (eg: embankment in place, topsoil, etc.) Soil containing invasive plant material shall not be buried within 100 ft of a water body (including wetlands). Disposal of surplus excavated material generated from this disposal method shall be at no additional cost to the State.
- *NYSDEC Quarry/ Mine Reclamation* - Where feasible and accessible, material shall be transported to an approved quarry/ mine accepting invasives-contaminated fill material.
- *Landfill/ Incinerator* - Plant material or spoil containing invasive plant material shall be disposed of in a municipal solid waste management facility or incinerator that is operated under current 6 NYCRR Part 360 regulations.
- *Approved NYSDOT disposal facility* - Where available, plant material or spoil containing invasive plant material may be disposed of in regional invasive species disposal facilities as identified in the contract documents.

**ITEM 617.01010024 – CONTROLLING INVASIVE PLANT SPECIES WITH  
HERBICIDES****ITEM 617.01020024 – CONTROLLING INVASIVE PLANT SPECIES BY PULLING****ITEM 617.01030024 – CONTROLLING INVASIVE PLANT SPECIES BY EXCAVATION****ITEM 617.10000024 – DISPOSAL OF MATERIAL CONTAINING INVASIVE PLANT  
SPECIES****ITEM 617.11000024 – EQUIPMENT CLEANING FOR INVASIVE PLANT SPECIES**

Stockpiling and stockpile location(s) of soil containing invasive plant material shall be approved by the Engineer. Invasive species spoil stockpiled on site shall be identified as such so not to be inadvertently used in a manner that is not consistent with *Disposal of Material*. Stockpiles shall be stabilized to prevent erosion and transport of invasive material. Stockpiling shall be at no cost to the State.

The Contractor shall identify the disposal location(s) and obtain approval from the Engineer at least 5 calendar days prior to disposal.

**Equipment Cleaning.** Equipment used in areas containing invasive plant species shall be power-washed (1000 psi minimum) and cleaned with clean water (without using cleaning soaps or chemicals) before leaving the invasive control/removal area to prevent the spread of seeds, roots, or other viable plant parts. Water may be supplied by a municipal water source or may be pumped from an on-site or local surface water source. If water is drawn from a local water source, to protect aquatic life, there shall not be any loss of water elevation at the site of withdrawal or immediately downstream of the site. Withdrawal from surface waters may be subject to USACOE, NYSDEC and other regulations. Equipment cleaning stations shall include either a constructed cleaning station conforming to §209-3.13 *Construction Entrances* or a portable commercial cleaning station with a rack. Loose plant and soil material that has been removed from clothing, boots and equipment, or generated from cleaning operations, including constructed cleaning station material after use, shall be disposed of as described in *Disposal of Material*. If sufficient space is not available or precluded by terrain to provide a cleaning station on site, upon approval by Engineer, equipment used within an infested area may be power-washed adjacent to the invasive control/removal area, provided that the wash water (including spray) does not discharge within 100 ft of any stream, existing or proposed wetland, or stormwater conveyance (eg: ditch, catch basin, etc). If upon completion of construction, the area remains infested with invasive plants, the invasive material generated may remain in the infested area.

**Care of Controlled Areas During Construction.** The Department will inspect all treated areas approximately every 4 weeks during the growing season (or during the following growing season for fall applications if contract continues into the following growing season). If additional treatments are necessary, the Contractor shall apply treatment to all identified areas within 10 calendar days of notification. Additional treatments will be considered extra work.

**METHOD OF MEASUREMENT.**

**Herbicides.** The quantity of controlling invasive species to be measured for payment will be in square feet of surface area controlled, measured to the nearest square foot.

**Pulling.** The quantity of controlling invasive species to be measured for payment will be in

**ITEM 617.01010024 – CONTROLLING INVASIVE PLANT SPECIES WITH  
HERBICIDES**

**ITEM 617.01020024 – CONTROLLING INVASIVE PLANT SPECIES BY PULLING**

**ITEM 617.01030024 – CONTROLLING INVASIVE PLANT SPECIES BY EXCAVATION**

**ITEM 617.10000024 – DISPOSAL OF MATERIAL CONTAINING INVASIVE PLANT  
SPECIES**

**ITEM 617.11000024 – EQUIPMENT CLEANING FOR INVASIVE PLANT SPECIES**

square feet of surface area controlled, measured to the nearest square foot.

**Excavation.** The quantity of controlling invasive species to be measured for payment will be in cubic yards removed, measured to the nearest cubic yard.

**Disposal of Material Containing Invasive Plant Species.** The quantity to be measured for payment of contaminated material disposal will be in cubic yards removed, measured to the nearest cubic yard.

**Equipment Cleaning for Invasive Plant Species.** The quantity to be measured for payment of equipment cleaning will be on a lump sum basis.

**BASIS OF PAYMENT.**

**Herbicides.** The unit price bid will include the cost of all labor, materials and equipment necessary to perform site preparation and satisfactorily complete the work.

**Pulling.** The unit price bid shall include the cost of all labor, materials and equipment necessary to satisfactorily complete the work.

**Excavation.** The unit price bid shall include the material and work required to perform site preparation, excavation, backfill the excavated area and surplus material removal. Backfill quantity shall not exceed the quantity of material excavated.

**Disposal of Material Containing Invasive Plant Species.** The unit price bid shall include the cost of all labor, materials and equipment necessary to satisfactorily complete the work.

**Equipment Cleaning for Invasive Plant Species.** The lump sum price bid shall include the cost of all labor, materials and equipment necessary to satisfactorily complete the work.

***Payment will be made under:***

<b>Item No.</b>	<b>Item</b>	<b>Pay Unit</b>
617.01010024	Controlling Invasive Plant Species with Herbicides	Square Foot
617.01020024	Controlling Invasive Plant Species by Pulling	Square Foot
617.01030024	Controlling Invasive Plant Species by Excavation	Cubic Yard
617.10000024	Disposal of Material Containing Invasive Plant Species	Cubic Yard
617.11000024	Equipment Cleaning for Invasive Plant Species	Lump Sum

**ITEM 627.50140008 - CUTTING PAVEMENT****DESCRIPTION:**

The contractor shall cut existing asphalt pavement, concrete pavement, asphalt surface course, or asphalt concrete overlay on concrete pavement at the locations indicated and detailed on the plans and as directed by the Engineer.

**MATERIALS:**

None specified.

**CONSTRUCTION DETAILS:**

Existing pavement and overlay shall be cut perpendicular to the roadway surface along neat lines, and to the depth indicated on the plans and typical sections, using appropriate equipment. After the pavement has been cut through, the Contractor may use pry bars, pneumatic tools or other methods, to pry loose the pavement to be removed from the pavement that is to remain. A pavement breaker may be used to break up the pavement to be removed after the pavement has been completely cut through and completely free from the pavement to remain.

When pavement cutting is called for in the Contract documents, if a neat vertical face with minimal shatter is obtained by performing an adjacent operation (such as milling) which eliminates the need to perform a separate pavement cutting operation, payment will be made for both the pavement cutting item and the item for the adjacent operation.

Any existing pavements and curbs not indicated to be removed that are damaged by the contractor's operations, shall be repaired at no additional cost to the State. Pavement cutting that the contractor chooses to do for his/her own convenience shall not receive any additional payment from the State.

**METHOD OF MEASUREMENT:**

The quantity to be measured will be the number of linear feet of pavement cutting satisfactorily completed.

**BASIS OF PAYMENT:**

The unit price bid per linear foot of pavement cutting shall include the cost of all labor, materials, and equipment necessary to satisfactorily complete the work.

Payment for prying, breaking, removal and disposal of cut pavement shall be made through other appropriate items.



**ITEM 660.6100XX25 -****REIMBURSEMENT TO (SPECIFIC UTILITY) FOR FURNISHING UTILITY SERVICE****1. DESCRIPTION:**

- 1.01 Under this item, the Contractor shall reimburse the Utility, (See Section 5.03) for work performed and material installed by the Utility, as specified in the Contract Documents or as ordered by the Engineer to provide utility service at the location indicated in the Contract Documents.

**2. MATERIALS:**

- 2.01 All materials will be furnished by the Utility.

**3. CONSTRUCTION DETAILS:**

- 3.01 The Contractor shall notify the Utility when the contract site is ready for the Utility work, shall insure that the site is readily and safely accessible to the Utility's workers and equipment, and shall conduct his operations in such a manner as to allow the Utility's forces to perform their work efficiently.
- 3.02 All labor and equipment necessary to accomplish the work shall be furnished, installed and supervised by the Utility except that if there is a survey and stakeout item in the Contract, the Contractor shall perform any stakeout of the location to which utility service is to be supplied before the Utility starts work.

**4. METHOD OF MEASUREMENT:**

- 4.01 This item will be measured for payment on a dollars-cents basis for work completed in accordance with this Specification, the Contract Documents, and as directed by the Engineer.

**5. BASIS OF PAYMENT:**

- 5.01 The amount set forth in the Proposal is a fixed price for all bidders. Any bid, other than the specified amount shown on the itemized proposal, will be adjusted to reflect the fixed price and the Contractor shall be entitled to payment for this item strictly in accordance with this paragraph. The actual payment for the item will be based upon the billing submitted by the Utility for work performed, with such billing being subject to approval by the Authority. At such time as the Engineer-In-Charge indicates to the Contractor that the Authority approves any billing submitted by the Utility, he shall direct the Contractor to pay the Utility the approved amount. After proof of payment to the Utility is received by the Engineer, the Contractor thereafter shall be entitled to the amount paid to the Utility plus 5% for the Contractor's preparatory and processing costs associated with this item. The fixed price, as adjusted to reflect actual payments to the Utility, is intended to be reimbursement of the Utility for the necessary furnishing of utility service, with the additional 5% being paid to the Contractor for his costs.
- 5.02 Payment for any necessary stakeout work shall be included in the Survey and Stakeout Item.

**ITEM 660.6100XX25 -****REIMBURSEMENT TO (SPECIFIC UTILITY) FOR FURNISHING  
UTILITY SERVICE****5. BASIS OF PAYMENT:** (cont'd)

5.03 Payment will be made under:

<b><u>ITEM NO.</u></b>	<b><u>DESCRIPTION</u></b>	<b><u>PAY UNIT</u></b>
660.61000125	Reimbursement to Central Hudson Gas & Electric for Furnishing Utility Service	Dollars-Cents
660.61000225	Reimbursement to National Grid (Formerly Niagara Mohawk) for Furnishing Utility Service	Dollars-Cents
660.61000325 Cents	Reimbursement to Verizon for Furnishing Utility Service	Dollars-
660.61000425	Reimbursement to Taconic Telephone Corp. for Furnishing Utility Service	Dollars-Cents
660.61000625	Reimbursement to Frontier Corp. for Furnishing Utility Service	Dollars-Cents
660.61000725 Cents	Reimbursement to RG&E for Furnishing Utility Service	Dollars-
660.61000825 Cents	Reimbursement to ConEd for Furnishing Utility Service	Dollars-
660.61000925	Reimbursement to NYSEG for Furnishing Utility Service	Dollars-Cents
660.61001025	Reimbursement to Orange and Rockland Utilities, Inc., for Furnishing Utility Service	Dollars-Cents
660.61001125 Cents	Reimbursement to TRANSCOM or TELVENT for Furnishing Utility Service	Dollars-

**ITEM 660.78040001 - HDPE PIPE BY DIRECTIONAL DRILLING - 4"**  
**ITEM 660.78060001 - HDPE PIPE BY DIRECTIONAL DRILLING - 6"**  
**ITEM 660.78080001 - HDPE PIPE BY DIRECTIONAL DRILLING - 8"**  
**ITEM 660.78100001 - HDPE PIPE BY DIRECTIONAL DRILLING - 10"**  
**ITEM 660.78120001 - HDPE PIPE BY DIRECTIONAL DRILLING - 12"**  
**ITEM 660.78140001 - HDPE PIPE BY DIRECTIONAL DRILLING - 14"**  
**ITEM 660.78160001 - HDPE PIPE BY DIRECTIONAL DRILLING - 16"**

## **DESCRIPTION**

The Contractor shall furnish and install a High Density Polyethylene (HDPE) water main or sanitary sewer main by the directional drilling method in accordance with these specifications and the contract plans. The Contractor will take all necessary precautions and shall furnish any and all labor, equipment and materials required to handle all water, storm, seepage, surface, subsurface, flood and tidal storm flows which may be encountered at any time during construction of the work. The methods of providing for these contingencies will be subject to the approval of the Engineer.

## **MATERIALS**

High Density Polyethylene Pipe shall be SDR-9 or SDR-11 and shall meet the requirements of AWWA C906, PPI PE 3408 and ASTM D3350 B PE 345444C. The manufacturer shall prepare and submit the appropriate material to the EIC. The supplier shall provide materials certifications through the Contractor to the Engineer as part of the evidence of acceptability for the material at least 10 days prior to shipment of the product to the job site. The pipe shall be colored coded for the intended use. A blue stripe shall be used for water pipe and a green stripe for sanitary sewer pipe. The tracer wire shall be a stainless steel 14 gauge (min.) wire with a 45 mil hdpe jacket manufactured by Kris-Tech Wire or approved equal.

## **CONSTRUCTION DETAILS**

- A. The alignment and profile of the main shall be as shown on the contract plans.
- B. The rig side work space and the pipe side work space shall be determined subject to the approval of the Engineer. The working areas should not encroach on private property or interfere with existing structures.
- C. Prior to beginning construction, the contractor shall submit to the Engineer a detailed drilling procedure for installation of the crossing, a drill site layout drawing and a proposed work schedule.
- D. The contractors attention is directed to the environmental constraints and restrictions in the permits and elsewhere herein. He is advised that all of his operations must be conducted in strict conformance and adherence thereto, all to the satisfaction of the Engineer.

## **INSTALLATION**

- A. Special care in handling shall be exercised during delivery and distribution of pipe to avoid

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damage. Damaged pipe shall be rejected and replaced at the Contractor's expense. The pipe shall be stored prior to use in such a manner as to keep the interior free from dirt and foreign matter. Any pipe that becomes contaminated shall be hand cleaned and washed before it is incorporated in the work.

B. The Contractor shall haul, heat fuse joints and hydrostatically test the pipeline in one section.

C. The alignment shall conform to the following requirements:

- Ground entry and exit angles shall be as listed on the contract drawings, plus or minus 2 degrees.
- Minimum bending radius of the installed pipe line shall be no less than 25 times the O.D. of the HDPE pipe.
- The actual exit point shall be no more than 10 feet left or right of the alignment for the proposed exit point.
- The actual exit point shall be no more than 10 feet short of or 30 feet beyond the proposed exit point.
- The vertical profile as shown on the drawings is the minimum depth to which the pipe line shall be installed.
- Contractor may, at his option and with the permission of the Engineer, elect to install the pipe at a greater depth than shown on the drawings.
- Contractor shall limit the longitudinal pull on the product line so as not to exceed 72% of the specified minimum yield strength (SMYS) of the pipe. Contractor shall continuously monitor the longitudinal pulling forces during pipeline pullback.

D. The drilling operation shall be directed using steering and tracking systems capable of producing the required alignment. The control system shall provide an angle of inclination reading and the direction in which the cutting tool is pointing. The Engineer shall have access at all times to measuring or gauging devices used for the horizontal drill including drilling logs maintained by the Contractor. The Contractor shall mobilize the drilling equipment, erect the rig, drill a pilot hole, enlarge the hole as necessary and pullback the prefabricated pipe string through the borehole. The pipeline shall be adequately supported on rollers during pullback of the pipeline into the pre-drilled hole. The rollers and cradles shall be of a type that will prevent damage to the pipeline and will be of sufficient number to

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prevent over stressing during the pullback procedure. Pullback equipment shall be adequate for the required thrust. A 14-1 gauge tracer wire shall be pulled with the pipeline.

Procedures should be taken to avoid bentonite leakage. The Contractor shall supply water for mixing drilling fluid, and shall supply portable mud tanks or construct temporary mud pits to contain excess drill fluids during construction. Upon completion of the crossing, the Contractor shall dispose of any drill cuttings and excess drill fluids in a manner consistent with the local and state regulations.

E. In the event that the Contractor must abandon the drill hole before completion of the crossing, the Contractor shall seal the borehole and redrill the crossing at the Contractors expense.

F. The Contractor is expressly prohibited from laying any pipes and special castings, or other appurtenances, except under the direct supervision of the Engineer.

G. Shutdowns of any portion of the service, to make connections with the existing mains, will be made only with the approval of the Engineer and the utility owner. When any main is shut off for such purposes, the work on the connection shall be carried on continuously by the Contractor and with all possible dispatch until the water is again turned into the main. A maximum period of four hours is allowed to make the connections.

#### **FLUSHING, TESTING AND DISINFECTION**

A. The Contractor shall maintain service and adequate fire protection where service is interrupted because of the changes required in the mains.

B. The work of laying the pipes shall be of such character as to leave all the pipes and connections water tight. To insure these conditions, the Contractor shall subject all mains and their appurtenances to a proof by water pressure in a manner which will meet the requirements of the utility owner.

C. The water pipe shall be disinfected in accordance with the requirements of the local Water District. Chlorinated water may not be discharged to the waterway. Chlorinated water must be removed by tank to an acceptable disposal facility.

#### **METHOD OF MEASUREMENT**

These items will be measured by the number of linear foot (Laying length) of each size pipe furnished and incorporated in the work in a manner satisfactory to the Engineer and the utility owner. The measurement will be made along the axis of the pipe.

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#### **BASIS OF PAYMENT**

The price bid per linear foot shall cover the furnishing, delivering, handling, drilling, cutting and joining pipe, making the necessary tests, sterilization, and all labor and materials necessary to complete the work except that trench and culvert excavation, and sheet piling will be paid for under their respective items.

Progress payments may be made at the unit price bid for 80 percent of the quantity of pipe installed. The remaining 20 percent will be paid for when the testing of the system has been completed.

**ITEM 660.81000007 - HOLD UTILITY POLE IN PLACE****DESCRIPTION**

This work shall consist of holding utility poles in place during construction in accordance with the contract documents and as directed by the Engineer.

**MATERIALS**

None Specified.

**CONSTRUCTION DETAILS**

The contractor shall comply with utility company regulations.

It shall be the contractor's responsibility to investigate existing conditions and to protect and support in a suitable manner the utility poles themselves during trenching and excavation operations. The Contractor shall repair any damage to the utility facilities caused by their operations, and if the nature of the damage is such as to endanger the operation of these utilities and the necessary repairs are not made by the Contractor, the work may be performed by the Utility Owners and the cost thereof charged to the Contractor at no additional cost to the State.

The Contractor shall notify the involved utilities of the "scope of work" 2 weeks in advance of the trenching and excavation work and must comply with the utility company's safety standards.

The contractor shall hire one of the contractors from the approved list of utility contractors to hold the utility poles. The list of approved utility contractors is located in the contract documents.

**METHOD OF MEASUREMENT**

This work will be measured as the number of EACH Utility Pole held in place by the Contractor.

**BASIS OF PAYMENT**

The unit price bid for this item shall include the cost of furnishing all labor, materials, tools, equipment, and safety equipment as determined by U.S. Department of Labor's Occupational Safety and Health Standards and incidentals as necessary to complete the work.

**ITEM 662.05000001 - FURNISH TELEPHONE SERVICE****DESCRIPTION**

Under this item, the Contractor shall reimburse the Utility, Verizon New York Inc. for work performed and material installed by the Utility, as specified in the contract documents or as ordered by the Engineer to provide telephone service at the location indicated in the contract documents.

**MATERIALS**

All materials will be furnished by the Utility

**CONSTRUCTION DETAILS**

The Contractor shall notify the Utility when the contract site is ready for the utility work. The Contractor shall insure that the site is readily and safely accessible to the Utility's forces and equipment, and shall conduct operations in such a manner as to allow the Utility's forces to perform their work efficiently.

All labor and equipment necessary to accomplish the work shall be furnished, installed and supervised by the Utility except that the Contractor shall perform the necessary survey and stakeout at the location where telephone service is to be provided before the Utility starts work.

**METHOD OF MEASUREMENT**

This item will be measured for payment on a lump sum basis for work completed in accordance with this specification, the contract documents, and as directed by the Engineer.

**BASIS OF PAYMENT**

The amount set forth in the proposal is a fixed price for all bidders. Any bid, other than the specified amount shown on the itemized proposal, will be adjusted to reflect the fixed price and the Contractor shall be entitled to payment for this item strictly in accordance with this specification. The actual payment for the item will be based upon the billing submitted by the Utility for work performed, with such billing being subject to approval by the Department. At such time as the Department approves any billing submitted by the Utility, the Engineer will direct the Contractor to pay the Utility the approved charge. The Contractor thereafter shall be entitled to the approved amount plus 5% for the Contractor's preparatory and processing costs associated with this item.



**ITEM 662.6000nn08 – FURNISHING ELECTRICAL SERVICE****DESCRIPTION**

Under this item, the Contractor shall pay the Utility, as invoiced by the individual Utility, the amount shown on the invoice in payment for work performed and material installed by the Utility, as specified in the Contract Documents or as ordered by the Engineer to provide electrical service at the location indicated in the Contract documents.

**MATERIALS**

All materials will be furnished by the Utility.

**CONSTRUCTION DETAILS**

The Contractor shall notify the Utility when the contract site is ready for the Utility work, shall insure that the site is readily and safely accessible to the Utility's workers and equipment, and shall conduct his operations in such a manner as to allow the Utility's forces to perform their work efficiently.

All labor and equipment necessary to accomplish the work shall be furnished, installed and supervised by the Utility except that if there is a survey and stakeout item in the Contract, the Contractor shall perform any stakeout of the location to which electrical service is to be supplied before the Utility starts work.

**METHOD OF MEASUREMENT**

The pay item will be measured on a fixed price Dollar Cents pay unit basis.

**BASIS OF PAYMENT**

The pay item is a 'draw down' item. As payments are made to the Utility, the receipts for the payments shall be submitted to the Engineer. The Contractor will be reimbursed for receipted costs of material, labor and equipment plus 5%. The actual payment for the item will be based upon the billing submitted by the Utility for the work performed, with such billing being subject to approval by the Department.

The total cost shown in the itemized proposal for this pay item will be considered the price bid even though payment will be made only for actual invoices paid plus 5%. The unit price amount is not to be altered in any manner by the bidder. Should the bidder alter the amount shown, the altered figure will be disregarded, and the original price will be used to determine the total amount bid for the contract.

Note – nn equals serialized by location

**DESCRIPTION**

This work shall consist of furnishing and installing ITEM 663.1001NN07 - PACKAGED BOOSTER WATER PUMPING STATION in accordance with the contract documents and as directed by the Engineer.

**MATERIALS**

As specified in the contract details and in the special note titled "Packaged Booster Water Pumping Station" included in the contract documents.

**CONSTRUCTION DETAILS**

Construction details as shown in the contract plans and described in the special note titled "Packaged Booster Water Pumping Station" included in the contract documents.

**METHOD OF MEASUREMENT**

This work will be measured for payment on a lump sum basis for the work completed in accordance with the contract documents.

**BASIS OF PAYMENT**

The lump sum price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work.

NN - Serialization for multiple Stations

**ITEM 663.1002NN07 – PACKAGED HYDROPNEUMATIC/RE-CHLORINATION  
STATION****DESCRIPTION**

This work shall consist of furnishing and installing ITEM 663.1002NN07 – PACKAGED HYDROPNEUMATIC/RE-CHLORINATION STATION in accordance with the contract documents and as directed by the Engineer.

**MATERIALS**

As specified in the contract details and in the special note titled “Packaged Hydropneumatic/Re-Chlorination Station” included in the contract documents.

**CONSTRUCTION DETAILS**

Construction details as shown in the contract plans and described in the special note titled “Packaged Hydropneumatic/Re-Chlorination Station” included in the contract documents.

**METHOD OF MEASUREMENT**

This work will be measured for payment on a lump sum basis for the work completed in accordance with the contract documents.

**BASIS OF PAYMENT**

The lump sum price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work.

NN - Serialization for multiple Stations

**DESCRIPTION**

This work shall consist of furnishing and installing ITEM 663.1003NN07 - PACKAGED PRESSURE REDUCING VALVE VAULT in accordance with the contract documents and as directed by the Engineer.

**MATERIALS**

As specified in the contract details and in the special note titled "Packaged Pressure Reducing Valve Vault" included in the contract documents.

**CONSTRUCTION DETAILS**

Construction details as shown in the contract plans and described in the special note titled "Packaged Pressure Reducing Valve Vault" included in the contract documents.

**METHOD OF MEASUREMENT**

Measurement will be made for the number of packaged pressure reducing valve vaults furnished and installed where shown on the plans, or as directed by the Engineer.

**BASIS OF PAYMENT**

The unit price bid shall include all labor, tools, equipment and material necessary to satisfactorily install the packaged pressuring reducing valve vault, including disinfection.

NN - indicates serialized for multiple sizes if needed.

**ITEM 663.1004NN07 – RESIDENTIAL PRESSURE REDUCING VALVE****DESCRIPTION**

This work shall consist of furnishing and installing ITEM 663.1004NN07 – RESIDENTIAL PRESSURE REDUCING VALVE in accordance with the contract documents and as directed by the Engineer.

**MATERIALS**

As specified in the contract details and in the special note titled “Residential Pressure Reducing Valve” included in the contract documents.

**CONSTRUCTION DETAILS**

Construction details as shown in the contract plans and described in the special note titled “Residential Pressure Reducing Valve” included in the contract documents.

**METHOD OF MEASUREMENT**

Measurement will be made for the number of residential pressure reducing valves furnished and installed where shown on the plans, or as directed by the Engineer.

**BASIS OF PAYMENT**

The unit price bid shall include all labor, tools, equipment and material necessary to satisfactorily install a residential pressure release valve, including disinfection.

NN - indicates serialized for multiple sizes if needed.

**DESCRIPTION**

This work shall consist of furnishing and installing ITEM 663.10050007 – BLOW-OFF HYDRANT in accordance with the contract documents and as directed by the Engineer.

**MATERIALS**

As specified in the contract details and in the special note titled “Blow-Off Hydrant” included in the contract documents.

**CONSTRUCTION DETAILS**

Construction details as shown in the contract plans and described in the special note titled “Blow-Off Hydrant” included in the contract documents.

**METHOD OF MEASUREMENT**

Measurement will be made for the number of Blow-Off Hydrants furnished and installed where shown on the plans, or as directed by the Engineer.

**BASIS OF PAYMENT**

The unit price bid shall include all labor, tools, equipment and material necessary to satisfactorily install the Blow-Off Hydrant, including disinfection.

**ITEM 663.10060007 – AIR RELEASE VALVE ASSEMBLY****DESCRIPTION**

This work shall consist of furnishing and installing ITEM 663.10060007 – AIR RELEASE VALVE ASSEMBLY in accordance with the contract documents and as directed by the Engineer.

**MATERIALS**

As specified in the contract details and in the special note titled “Air Release Valve Assembly” included in the contract documents.

**CONSTRUCTION DETAILS**

Construction details as shown in the contract plans and described in the special note titled “Air Release Valve Assembly” included in the contract documents.

**METHOD OF MEASUREMENT**

Measurement will be made for the number of air release valves furnished and installed where shown on the plans, or as directed by the Engineer.

**BASIS OF PAYMENT**

The unit price bid shall include all labor, tools, equipment and material necessary to satisfactorily install an air release valve assembly, including disinfection.

**DESCRIPTION**

This work shall consist of furnishing ITEM 663.10070007 – WATER METERS AND REMOTE READ SYSTEM in accordance with the contract documents and as directed by the Engineer.

**MATERIALS**

As specified in the contract details and in the special note titled “Water Meters and Remote Read System” included in the contract documents.

**CONSTRUCTION DETAILS**

Construction details as shown in the contract plans and described in the special note titled “Water Meters and Remote Read System” included in the contract documents.

**METHOD OF MEASUREMENT**

This work will be measured for payment on a lump sum basis for the work completed in accordance with the contract documents.

**BASIS OF PAYMENT**

The lump sum price bid shall include the cost of furnishing the number of water meter units indicated in the special note titled “Water Meters and Remote Read System” and complete meter reading system.



**ITEM 663.10080007 - RESIDENTIAL WATER PLUMBING CONNECTION****DESCRIPTION**

This work shall consist of furnishing and installing RESIDENTIAL WATER PLUMBING CONNECTION in accordance with the contract documents and as directed by the Engineer.

**MATERIALS**

As specified in the contract details and in the special note titled “Residential Water Plumbing Connection” included in the contract documents.

**CONSTRUCTION DETAILS**

Construction details as shown in the contract plans and described in the special note titled “Residential Water Plumbing Connection” included in the contract documents.

**METHOD OF MEASUREMENT**

This work will be measured for the number of residential water plumbing connections completed in accordance with the contract documents.

**BASIS OF PAYMENT**

The unit price bid shall include the cost of furnishing the number of residential water plumbing connections indicated in the contract documents or as directed by the Engineer.

**ITEM 663.50000017 - INSTALLING WATER SUPPLY UTILITIES BY  
DIRECTIONAL DRILLING**

**DESCRIPTION**

This work shall consist of furnishing and installing water supply utilities by directional drilling methods in accordance with these specifications and the contract plans.

**MATERIALS**

All of the requirements of §663 - Water Supply Utilities apply, except as modified herein. Provide to the Engineer the appropriate materials certification as part of the evidence of acceptability for the supplied materials at least 10 days prior to the shipment of the product to the job site.

**CONSTRUCTION DETAILS**

**A. General**

**1. Clear Holes.** Clear all directional drill hole locations in accordance with New York State Department of Public Service Rule 753.

**2. Equipment.** Furnish equipment of adequate capacity and power to install water supply utilities by directional drilling methods. Supplement each rig with the necessary auxiliaries, appurtenances, tools and other equipment required for proper operation. The alignment(s), profile(s), size(s), and length(s) of the water supply utilities are specified in the contract documents.

**3. Submittal.** Submit for review and approval a detailed work plan and schedule of activities required to perform all directional drilling, including any proposed variation from the methods and techniques stipulated in this Specification. Information in this work plan should include, but not be limited to, the following:

- a. Qualifications of the Contractor showing that all directional drilling operations will be performed by a competent driller with a minimum of 5 years of relevant experience. Completed projects with details of the types of pipe installations, owner contact names, and telephone numbers must be included.
- b. Designed direction drill path indicating compliance with the project design criteria.
- c. Method for directional drilling indicating the following:
  - i. Plan showing the work zone equipment configuration at the end of the bore(s), staging areas, storage areas and the location of slurry, cuttings and pit spoil handling areas.
  - ii. Equipment list including make and model number and specifications (catalog cuts) of all major equipment proposed for use on the project. The Contractor is responsible for the final determination of the drill rig size based on the length and depth of the actual runs, the subsurface conditions expected, etc.
  - iii. Boring procedure, tooling for drilling, method to control slurry, design of entrance

**ITEM 663.50000017 - INSTALLING WATER SUPPLY UTILITIES BY  
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and exit pits and method to verify that installed water supply utilities is acceptable.

- iv. Materials list including bentonite and bentonite additives proposed for use on the project along with material detail sheets for all other materials used on the site, water supply utility product data sheets showing steel type and all dimensions and tolerances and water source for drilling operations.
  - v. Steering and tracking equipment, procedures and proposed locations of ground based tracking coils or other equipment requiring surface or subsurface access.
- d. Method(s) for erosion and sediment control.
- 4. Approval of Submittal.** Do not start work prior to receiving the Engineer's written approval. Approval, if granted, will be based on the decision of the Director, Geotechnical Engineering Bureau (DGEB) as to the acceptability of the proposed work plan and any variations to provide satisfactory installation of the water supply utilities and avoid damage. The Engineer will forward the proposed work plan to the DGEB for review. The DGEB requires 20 working days from the date of receipt of the proposed work plan in the Bureau to perform his review. Approval will remain in force only as long as all conditions set forth in the approval are met and satisfactory results are obtained. In the event that unsatisfactory results and/or damage occur, the Contractor will stop work and modify his methods and submit them for review and approval.
- 5. Shoring.** Shore entrance and exit pits as necessary to meet OSHA requirements.
- 6. ROW.** Perform all work within the designated right-of-way limits shown on the contract plans.
- 7. Utilities.** Protect any existing underground utilities during this work.

**B. Installation**

- 1. General.** Exercise special care and handling during delivery and distribution of water supply utilities to avoid damage. Damaged water supply utilities will be rejected and replaced at the Contractor's expense. Store water supply utilities prior to use in such a manner as to keep the interior free from dirt and foreign material. Thoroughly clean any water supply utility that becomes contaminated before it is incorporated into the work.
- 2. Alignment.** The alignment of the water supply utility must conform to the following requirements:
- a. Choose the ground entry and exit angles such that water supply utilities can be installed along the alignment and profile indicated on the contract plans and to the depths indicated in the New York State Standard Sheets.
  - b. The entrance point(s) and exit point(s) shall be approved by the Engineer and physically

located in the field.

- c. The exit point(s) shall be no more than 1 foot left or right of the location in the field.
- d. The vertical depth, as specified in the New York State Standard Sheets, is the depth to which the water supply utilities shall be installed.
- e. The Contractor may, with written permission from the Local Water District and the Engineer, elect to install the water supply utilities at a greater depth than shown in the New York State Standard Sheets.
- f. Limit the longitudinal pull so as to prevent any damage of the water supply utilities. Continuously monitor the longitudinal pulling forces during pullback of water supply utilities.

### **3. Installation Procedure**

- a. Direct all drilling operations using steering and tracking systems capable of producing the required alignment. The control system shall provide an angle of inclination reading and the direction in which the cutting tool is pointing. Provide access to the Engineer at all times to all measuring or gauging devices used for the drilling operations including drilling logs maintained by the Contractor.
- b. Adequately support the water supply utilities on rollers during the pullback into the pre-drilled hole. Rollers and cradles shall be of the type that will prevent damage to the water supply utility and in sufficient number to prevent overstressing during the pullback procedure. Pullback equipment shall be adequate for the length(s) and depth(s) of the runs and for the soil types encountered.
- c. Pull an additional length of pipe through the entrance pit upon pull back and expose it. The Engineer will examine the pipe for scratches, scores, gouges, cuts and other forms of damage. The permissible depths of gouges and scratches do not exceed 10 percent of the wall thickness of the pipe.
- d. Pull an adequate sized tracer wire with the water supply utilities.
- e. Take necessary procedures to prevent bentonite leakage.
- f. Supply water for mixing drilling fluid.
- g. Supply portable mud tanks or construct temporary mud pits to contain excess drilling fluids during construction. Upon completion of the water supply utility installation, dispose of any cuttings and excess drilling fluids in a manner consistent with local and State regulations.

### **4. Abandoned Holes.** In the event that the drill hole must be abandoned before completion of

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the installation, fill abandoned drill holes with grout to prevent subsidence. Progress new drill holes at the Contractor's expense.

5. **Service Shutdown.** Shutdown of any portion of any water service to make connections with existing mains will be made only with the written approval of the Engineer and the Local Water District. When any service is shut down for such purposes, the work on the connection shall be carried on continuously by the Contractor until the water is again turned into the existing main. Maintain adequate water service and fire protection whenever service is interrupted.
6. **Construction Site.** During construction, maintain the site in a neat and orderly condition. At the completion of work, remove all temporary structures erected and materials required for temporary access, drill and pipe staging areas, platforms, and drilling fluids. Restore the area to the approximate original conditions.

**C. Flushing, Testing and Disinfection**

1. After water supply utility installations, demonstrate to the Engineer that the installations are continuous and without obstructions. In addition, test all water supply utilities and their appurtenances in accordance to the requirements of the Local Water District or §663 - Water Supply Utilities.
2. Disinfect all water supply utilities and their appurtenances in accordance with the requirements of the Local Water District or §663 - Water Supply Utilities. Do not discharge any chlorinated water into any waterway. Remove chlorinated water by tank to an acceptable disposal facility.

**METHOD OF MEASUREMENT**

This work will be measured as the number of linear feet of each size water supply utility furnished, measured in the field and installed to the satisfaction of the Engineer and the Local Water District.

**BASIS OF PAYMENT**

The unit price bid shall include the cost of furnishing all labor, materials and equipment (including dewatering if required) necessary to install water supply utilities and their appurtenances by directional drilling, furnishing and removing all equipment, pipe testing, grouting of abandoned bores, performing and supporting temporary excavations, and site restoration.

Progress payments will be made at the unit price bid for 80% of the quantity of water supply utility satisfactorily installed and accepted. The remaining 20% will be paid when the system has been successfully flushed, disinfected and tested to the satisfaction of the Engineer and the Local Water District.

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Under these items, the Contractor shall furnish, install and test loose tube single mode fiber optic cables as shown in the plans and as directed by the Engineer.

All equipment required for installation and testing shall be provided by the Contractor. Fiber optic patch panels, splice closures, connectors, snowshoes and pull boxes shall be supplied under other contract items.

Any other ancillary components required to form a complete fiber optic cable plant, including but not limited to, moisture and water sealants, cable caps, fan-out kits, etc., shall be supplied under these items for fiber optic cable and will not be paid for separately.

**MATERIALS:**

The single mode fiber optic cable shall incorporate a loose buffer tube cable design as specified herein. The fiber optic cable shall be suitable for conduit and aerial installation, supported by a messenger cable, in an outside cable plant environment and for indoor cabling environments when installed in accordance with the current NEC and local building code requirements.

A design using flooding compounds, water-swellaable tape or yarn to prevent water penetration between the buffer tubes shall be provided.

The cable shall meet the latest revision requirements of REA 7 CFR1755.900 at a minimum, and shall be new, unused and of current design and manufacture.

The number of fibers in each cable shall be as specified on the plans.

**Splicing Requirements**

All optical fibers shall be spliced to provide continuous runs. Splices shall be made at locations shown on the plans. Any other splices in the trunk cables shall be permitted only with the approval of the Engineer.

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. Tools and procedures shall be approved by the cable manufacturer as being compatible with the cable type being delivered.

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

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sleeve or housing, so as to protect the fiber from scoring, dirt or microbending.

Splice trays shall be used to hold the spliced fibers, with each fiber neatly secured to the tray.

Splice loss shall not exceed a mean of 0.03 dB. No splice losses above 0.06 dB shall be permitted. If a splice is measured to exceed 0.06 dB during the splicing process, it shall be remade until its loss falls below 0.06 dB. Each attempt shall be recorded for purposes of acceptance.

All splice losses shall be recorded in tabular form and submitted to the Engineer 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.

Splices specifically required for connecting drop cables or miscellaneous spur cables into the trunk/backbone cable system shall be supplied under another contract item. Splices of trunk/backbone cable segments directly to each other that are required due to reel length or other practical limitations shall be included under these items and shall not be paid for separately.

If splices to fiber optic A pigtails at (short one-fiber cables with connectors attached at the factory) are used to provide the method of connectorizing the fibers at the field cabinets and other termination points, these splices will be paid for under the item for fiber optic connectorization and not under the item for splicing.

### **Slack Storage of Fiber Optic Cables**

As part of these items, slack fiber shall be supplied as necessary for maintenance coils and to allow for splicing of the fiber optic cables in a controlled environment such as a splicing van or tent. The slack fiber shall then be stored underground in the fiber optic pull boxes.

### **Optical Requirements**

**Attenuation:** The attenuation shall be less than 0.64 decibels/mile (dB/mile) at a wavelength of  $5.16 \times 10^{-5}$  inches and less than 0.48 dB/mile at a wavelength of  $6.10 \times 10^{-5}$  inches. Fiber attenuation shall be uniform with no discontinuities greater than 0.1 dB. The attenuation at  $5.44 \times 10^{-5}$  inches +  $1.18 \times 10^{-7}$  inches shall not exceed 3.36 dB/mile. The attenuation measurements shall be in accordance with the latest EIA/TIA Standards FOTP-20, 59, 61 and 78. The average change in attenuation at extreme operational temperatures (-40° F to + 158° F) shall not exceed 0.081 dB/mile at  $6.10 \times 10^{-5}$  inches. The magnitude of the maximum attenuation change of each individual fiber shall not be greater than 0.24 dB/mile at  $6.10 \times 10^{-5}$  inches. The change in

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attenuation measurements shall be in accordance with the latest revisions of EIA/TIA Standard FOTP-3.

Cutoff Wavelength: The fiber cutoff wavelength shall be less than or equal to  $4.96 \times 10^{-5}$  inches.

Mode-Field Diameter:  $3.62 \times 10^{-4} \pm 1.57 \times 10^{-5}$  inches at  $5.16 \times 10^{-5}$  inches;  $4.09 \times 10^{-4} \pm 3.15 \times 10^{-5}$  inches at  $6.10 \times 10^{-5}$  inches.

Zero Dispersion Wavelength:  $5.17 \times 10^{-5}$  inches  $\pm 3.94 \times 10^{-7}$  inches

Zero Dispersion Slope: Shall be less than or equal to  $0.092 \text{ ps}/(\text{nm}^2 \cdot \text{km})$

Polarization Mode Dispersion: Shall be less than or equal to  $0.5 \text{ ps}/(\text{km})^2$

Chromatic Dispersion: The chromatic dispersion shall be less than  $3.3 \text{ ps}/(\text{nm} \cdot \text{km})$  for  $5.06 \times 10^{-5}$  inches through  $5.24 \times 10^{-5}$  inches and less than  $18 \text{ ps}/(\text{nm} \cdot \text{km})$  at  $6.10 \times 10^{-5}$  inches as measured in accordance with the latest revision of EIA/TIA Standard FOTP-169.

### **Mechanical Requirements**

Fibers: All optical fibers shall be Corning, Spectrum or Lucent single mode glass fibers 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:  $3.23 \times 10^{-4}$  inches

Cladding Diameter:  $4.92 \times 10^{-3} \pm 3.94 \times 10^{-5}$  inches

Core-to-Cladding Offset: less than or equal to  $3.15 \times 10^{-5}$  inches

Cladding Non-Circularity: less than or equal to 1.0%

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:

- |           |            |
|-----------|------------|
| 1. Blue   | 7. Red     |
| 2. Orange | 8. Black   |
| 3. Green  | 9. Yellow  |
| 4. Brown  | 10. Violet |
| 5. Slate  | 11. Rose   |
| 6. White  | 12. Aqua   |

The nominal colored fiber diameter shall be  $9.84 \times 10^{-3}$  inches.



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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  $9.64 \times 10^{-3} \pm 1.97 \times 10^{-4}$ .

The force required to mechanically remove at least 1 3/16 inches of unaged coating shall not exceed 2.25 lbf as measured in accordance with the latest revision of EIA/TIA Standard FOTP-178.

Central Strength Member: The anti-buckling central strength member shall consist of a Kevlar or epoxy-glass composite rod.

Buffering: All fibers shall be enclosed in non-conductive loose buffer tubes. Each buffer tube shall contain up to twelve 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:

- |           |            |
|-----------|------------|
| 1. Blue   | 7. Red     |
| 2. Orange | 8. Black   |
| 3. Green  | 9. Yellow  |
| 4. Brown  | 10. Violet |
| 5. Slate  | 11. Rose   |
| 6. White  | 12. Aqua   |

In buffer tubes containing multiple fibers, the colors shall be stable during temperature cycling and not be 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 hydrocarbon-based 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 dermatologic ally safe to exposed skin. It shall be chemically and mechanically compatible with all cable components, non-nutritive to fungus, non-hygroscopic and electrically non-conductive.

Filler Rods: Filler 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

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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 an approved stranding process to form a tight cable core. Binders shall be applied with sufficient tension to secure the tubes to the central member without crushing the buffer tubes.

Core and Cable Flooding: To prevent water penetration outside of the buffer tubes, all cavities within the cable shall be filled with a flooding compound or water blocking tape shall be used. The flooding compounds shall not affect the optical characteristics of the cable. The flooding compound shall contain anti-oxidant additives, and shall be readily removable with conventional solvents. The flooding compound shall be non-toxic and dermatologic ally safe to exposed skin. It shall be chemically and mechanically compatible with all cable components, non-nutritive to fungus, non-hygroscopic and electrically non-conductive.

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 tension of 606.98 lbf during installation and 200.08 lbf longterm 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 .06 inches. The polyethylene shall contain carbon black and shall not promote the growth of fungus. The outer jacket shall contain no metallic elements and shall be of a consistent thickness.

The jacket shall be marked in contrasting color at 3.28 feet intervals with the following information:

NYSDOT - XX - YYYY, where XX shall equal the number of optical fibers in the cable and YYYY shall be the month and year that the cable was manufactured.

In addition, the outer jacket shall have sequential meter markings as approved by the Engineer. The actual length of the cable shall be within 1% of the length markings.

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Ripcord: To facilitate cable preparation, the cable shall have an orange colored ripcord located under the outer jacket.

Bend Radius. The cable shall be capable of withstanding a minimum bending radius of 10 times its outer diameter during operation and 20 times its outer diameter during installation without changing the characteristics of the optical fibers.

### **Other Requirements**

Manufacturer's Certification: The following tests shall be performed and the results documented for a cable meeting the requirements herein. The cable manufacturer shall certify that each reel of cable furnished meets or exceeds the following specifications:

Water Penetration: When 3.28 foot static head of water or equivalent continuous pressure is applied at one end of 3.28 foot length of filled cable for 24 hours, no water shall leak through the open cable end. If the first sample fails, subsequent tests shall be done in accordance with either BELLCORE TR-TSY-000020 or REA PE-90. All 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  $158^{\circ} \pm 35.6^{\circ}$  F. If material flow is detected, the weight of any compound that drips from the sample shall be less than  $1.1 \times 10^{-4}$  lbs.

Compressive Strength: The cable shall withstand a minimum compressive load of 125.62 lbf/in applied uniformly over the length of the compression plate. The cable shall be tested in accordance with EIA/TIA Standard FOTP-41, except that the load shall be applied at the rate of 0.098 inches per minute and maintained for 1 minute. The magnitude of the attenuation change shall be within the repeatability measurement system for 90% of the test fibers. The remaining 10% of the fibers shall not experience an attenuation change greater than 0.1 dB at  $6.10 \times 10^{-5}$  inches. The repeatability of the measurement system is typically + 0.05 dB or less. No fibers shall exhibit a measurable change in attenuation after load removal.

Impact Resistance: When tested in accordance with EIA/TIA Standard FOTP-25, the cable shall withstand 20 impact cycles. The magnitude of the attenuation change shall be within the

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repeatability of the measurement system for 90% of the test fibers. The remaining 10% of the fibers shall not experience an attenuation change greater than 0.1 dB at  $6.10 \times 10^{-5}$  inches. The repeatability of the measurement system shall be + 0.05 dB or less. The cable jacket shall exhibit no cracking or splitting upon completion of the test.

Cable Flex: When tested in accordance with EIA/TIA Standard FOTP-104, the cable shall withstand 25 mechanical flexing cycles at a rate of 30 + 1 cycles per minute with a sheath diameter not greater than 20 times the cable diameter. The magnitude of the attenuation change shall be within the repeatability of the measurement system for 90% of the test fibers. The remaining 10% of the fibers shall not experience an attenuation change greater than 0.1 dB at  $6.10 \times 10^{-5}$  inches. The repeatability of the measurement system shall be + 0.05 dB or less. The cable jacket shall exhibit no cracking or splitting when observed under five times magnification.

Cable Freezing: When tested in accordance with EIA/TIA Standard FOTP-98, the cable shall be immersed in water. Upon freezing, the magnitude of the attenuation change shall be within the repeatability of the measurement system for 90% of the test fibers. The remaining 10% of the fibers shall not experience an attenuation change greater than 0.1 dB at  $6.10 \times 10^{-5}$  inches. The repeatability of the measurement system shall be + 0.05 dB or less. The cable jacket shall exhibit no cracking.

Jacket Shrinkage: When tested in accordance with EIA/TIA Standard FOTP-86, the maximum outer cable jacket shrinkback shall be less than 5%.

Lightning Protection: When tested in accordance with the proposed EIA/TIA Standard FOTP-181, the cable shall withstand a simulated lightning strike with a peak value of the current pulse greater than or equal to 105 kA. The test current used shall be damped oscillatory with a maximum time-to-peak value of 15  $\mu$ s (which corresponds to a minimum frequency of 16.7 kHz) and a maximum frequency of 30 kHz. The time to half-value of the waveform envelope shall be from 40-70  $\mu$ s.

Cable Twist: When tested in accordance with EIA/TIA Standard FOTP-85, a length of cable no longer than 6½ feet shall withstand 10 cycles of mechanical twisting. The magnitude of the attenuation change shall be within the repeatability of the measurement system for 90% of the test fibers. The remaining 10% of the fibers shall not experience an attenuation change greater than 0.1 dB at  $6.10 \times 10^{-5}$  inches. The repeatability of the measurement system shall be + 0.05

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dB or less. The cable jacket shall exhibit no cracking or splitting when observed under five times magnification.

Quality Assurance Provision: All optical fibers shall be proof tested by the fiber manufacturer at a minimum load of 145 psi.

All optical fibers shall be attenuation tested. The attenuation of each fiber shall be provided with each reel of cable furnished.

Environmental Requirements: The cable shall meet all of its specified requirements during and after being subjected to any combination of the following requirements:

Shipping/storage temperature: -58° F to +158° F

Installation temperature: -22° F to +158° F

Operating temperature: -40° F to +158° F

Relative humidity: From 0% to 95%, non-condensing

### **CONSTRUCTION DETAILS:**

#### **Experience Requirements**

Personnel involved in the installation, splicing and testing of the fiber optic cables shall meet the following requirements:

A minimum of three (3) years of experience in the installation of fiber optic cables; including fusion splicing, terminating and testing single mode fibers.

Have installed two systems where fiber optic cables are outdoors aerially and in conduit and where the systems have been in continuous satisfactory operation for at least two years. The Contractor shall submit as proof, photographs or other supporting documents, and the names, addresses and telephone numbers of the operating personnel who can be contacted regarding the installed fiber optic systems.

One fiber optic cable system (which may be one of the two in the preceding paragraph) that the Contractor can arrange for demonstration to NYSDOT representatives and the Engineer.

**ITEM 683.92211208 - FIBER OPTIC CABLE - 12 FIBERS**

**ITEM 683.92212408 - FIBER OPTIC CABLE - 24 FIBERS**

**ITEM 683.92213608 - FIBER OPTIC CABLE - 36 FIBERS**

**ITEM 683.92214808 - FIBER OPTIC CABLE - 48 FIBERS**

**ITEM 683.92216008 - FIBER OPTIC CABLE - 60 FIBERS**

**ITEM 683.92217208 - FIBER OPTIC CABLE - 72 FIBERS**

**ITEM 683.92219608 - FIBER OPTIC CABLE - 96 FIBERS**

Splicers shall have been trained and certified by the manufacturer of the fiber splice material to be used, in fiber optic splicing procedures. Proof of this training shall be submitted to the Engineer for approval.

Installers shall have been trained and certified by the manufacturer of the fiber optic cable to be used in fiber optic cable installation and handling procedures. Proof of this training shall be submitted to the Engineer for approval.

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. Proof of this training shall be submitted to the Engineer for approval.

#### Constructibility Review

The Contractor shall perform a careful and complete Constructibility Review of the proposed fiber optic system design. At least one month prior to beginning installation, the Contractor shall submit a report detailing the results of this review.

#### Installation in Conduit

The cable pulling operation shall be performed such that a minimum bending of the cable shall occur in the unreeling and pulling operations. Entry guide chutes shall be used to guide the cable into the pullbox conduit ports. Lubricating compound shall be used to minimize friction. Corner rollers (wheels), if used, shall not have radii less than the minimum installation bending radius of the cable. A series array of smaller wheels can be used for accomplishing the bend if the array is specifically approved by the cable manufacturers. The pulling tension shall be continuously measured and shall not be allowed to exceed the maximum tension specified by the manufacturer of the cable, or fuse links and breaks shall be used to ensure that the cable tensile strength is not exceeded. The pulling system shall have an audible alarm that shall sound whenever a preselected tension level is reached. Tension levels shall be recorded continuously and shall be given to the Engineer upon request.

The number of pullboxes and their locations shall be as shown on the plans. The Contractor may be required to install the cable one pullbox at a time. The direction of the cable pull shall be determined by the Contractor and shall require the approval of the Engineer.

**ITEM 683.92211208 - FIBER OPTIC CABLE - 12 FIBERS**  
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The central strength member and aramid yarn shall be attached directly to the pulling eye during cable pulling. "Basket grip" or "Chinese finger" type attachments to the cable outer jacket shall not be permitted. A breakaway swivel with a cable manufacturer approved tensile rating shall be used on all pulls.

When simultaneously pulling fiber optic cable with other cables, separate grooved rollers shall be used for each cable.

No fiber optic cable shall be pulled through more than one 90 degree bend unless so indicated on the plans or specifically approved by the Engineer.

### **Documentation Requirements**

#### **Installation Practices for Outdoor Fiber Optic Cable Systems Documentation**

At least one month prior to starting installation of the fiber optic cable plant, the Contractor shall submit to the Engineer for approval ten (10) copies of the Contractor's Installation Practices for Outdoor Fiber Optic Cable Systems at manual. This manual shall address the Contractor's proposed practices covering all aspects of the fiber optic cable plant. This submittal shall include all proposed procedures, list of installation equipment, and splicing and test equipment. Location of the splicing points with the description of the splicing function. Test and quality control procedures shall be detailed as well as procedures for corrective action.

#### **Testing Data:**

Optical Link Budget testing for point to point and closed loop fibers (for all fibers). OTDR testing plan and procedure, OTDR test data and its report (for all fibers).

**Operation and Maintenance Documentation:** After the fiber optic cable plant has been installed, ten (10) complete sets of Operation and Maintenance Documentation shall be provided. The documentation shall, as a minimum, include the following:

Complete and accurate as-built diagrams showing the entire fiber optic cable plant including locations of all splices.

Final copies of all approved test procedures

Complete performance data of the cable plant showing the losses at each splice location and each terminal connector.

**ITEM 683.92211208 - FIBER OPTIC CABLE - 12 FIBERS**

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**ITEM 683.92219608 - FIBER OPTIC CABLE - 96 FIBERS**

Complete parts list including names of vendors.

Complete maintenance and trouble-shooting procedures.

### **Testing Requirements**

All fibers shall be tested bi-directionally at both  $5.16 \times 10^{-5}$  inches and  $6.10 \times 10^{-5}$  inches. The Contractor shall submit detailed test procedures for approval by the Engineer.

The fiber optic cables shall be subjected to the levels of testing described in the General Provisions for ITS General Provisions for this project.

### **METHOD OF MEASUREMENT:**

The fiber optic cables will be measured for payment as the number of linear feet of cable, including lengths stored as splicing slack and maintenance coils, actually furnished and installed.

### **BASIS OF PAYMENT:**

The unit price bid per linear foot for fiber optic cable shall include the cost of furnishing all labor, material, documentation, tools and equipment and testing of the fiber optic cable necessary to complete the work.

Fifty percent (50%) of the bid price of each item will be paid upon satisfactory completion of Milestone 3, On-Site Stand Alone Tests; twenty percent (20%) will be paid upon satisfactory completion of Milestone 4, System Interface Test; twenty percent (20%) will be paid upon satisfactory completion of Milestone 5, System Performance Tests; and ten percent (10%) will be paid upon satisfactory completion of Milestone 6, 90 Day Operational Test, as described in the ITS Special Provisions part of the contract and within the plans/proposal.



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L05/07/09

**D263340**  
**SPECIAL NOTE**  
**STATE PREVAILING WAGE RATES**

The New York State Department of Labor (NYSDOL) has issued a project-specific prevailing wage rate schedule for this Contract. The New York State Labor Law requires the Contractor and all subcontractors to ensure that all workers employed in the performance of a public work contract are paid not less than the prevailing wage rate and supplemental (fringe) benefits in the locality where the work is performed.

The project-specific prevailing wage rate schedule, together with all updates and amendments, is incorporated by reference in this Contract, and made a part hereof, as though fully set forth herein. The schedule may be accessed by visiting the NYSDOL website, navigating to the appropriate web page for prevailing wages, and entering the Prevailing Rate Case Number (PRC#). The PRC# is found on NYSDOL Form PW-200, the following page in this Contract Proposal. The project-specific prevailing wage rate schedule and all wage rate amendments are annexed electronically through the following link:

[www.labor.ny.gov](http://www.labor.ny.gov)

It is the obligation of the Contractor and all subcontractors to obtain all updated prevailing wage rate schedules and to pay all workers in accordance with the periodic wage rate schedule updates issued by the NYSDOL. Any changes or clarifications of labor classifications, and information on the applicability of particular prevailing wage rates, must be obtained from the Office of the Director of the Bureau of Public Work at the New York State Department of Labor.



Andrew M. Cuomo, Governor

Roberta Reardon, Commissioner

NYS DOT

ARVIND SALGAM, DQAB PS&E UNIT  
NYSDOT  
POD 23  
50 WOLF ROAD  
ALBANY NY 12232

Schedule Year 2016 through 2017  
Date Requested 10/05/2016  
PRC# 2016010158

Location CLINTON  
Project ID# D263340  
Project Type DANNEMORA WATER DISTRICT #3; NYS ROUTE 374 S.H. 8357; RM 374 7102 1140 to RM 374 7102  
1187 MUNICIPALITIES: TOWN OF DANNEMORA COUNTIES: CLINTON

### 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 Wage Case Number (PRC#) has been assigned to the schedule(s) for your project.

The schedule is effective from July 2016 through June 2017. 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.state.ny.us](http://www.labor.state.ny.us). 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.

### 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.

There are very few exceptions to this rule. Complete information regarding these exceptions is available on the "[4 Day / 10 Hour Work Schedule](#)" form (PW 30R).

### 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 12240; Fax to Bureau of Public Work (518) 485-1870; or electronically at the NYSDOL website [www.labor.state.ny.us](http://www.labor.state.ny.us).

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.state.ny.us](http://www.labor.state.ny.us).

The Commissioner of Labor makes an annual determination of the prevailing rates. This determination is in effect from July 1st through June 30th of the following year. The annual determination is available on the NYSDOL website [www.labor.state.ny.us](http://www.labor.state.ny.us).

### 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 project's date of completion. 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.

Every contractor and subcontractor shall submit to the Department of Jurisdiction (Contracting Agency), within thirty (30) days after issuance of its first payroll and every thirty (30) days thereafter, a transcript of the original payrolls, subscribed and affirmed as true under penalty of perjury. The Department of Jurisdiction (Contracting Agency) shall collect, review for facial validity, and maintain such payrolls.

In addition, the Commissioner of Labor may require contractors to furnish, with ten (10) days of a request, payroll records sworn to as their validity and accuracy for public work and private work. Payroll records include, but are not limited to time cards, work description sheets, proof that supplements were provided, cancelled payroll checks and payrolls. Failure to provide the requested information within the allotted ten (10) days will result in the withholding of up to 25% of the contract, not to exceed \$100,000.00. If the contractor or subcontractor does not maintain a place of business in New York State and the amount of the contract exceeds \$25,000.00, payroll records and certifications must be kept on the project worksite.

The prime contractor is responsible for any underpayments of prevailing wages or supplements by any subcontractor.

All contractors or their subcontractors shall provide to their subcontractors a copy of the Prevailing Rate Schedule specified in the public work contract as well as any subsequently issued schedules. A failure to provide these schedules by a contractor or subcontractor is a violation of Article 8, Section 220-a of the Labor Law.

All subcontractors engaged by a public work project contractor or its subcontractor, upon receipt of the original schedule and any subsequently issued schedules, shall provide to such contractor a verified statement attesting that the subcontractor has received the Prevailing Rate Schedule and will pay or provide the applicable rates of wages and supplements specified therein. (See NYS Labor Laws, Article 8 . Section 220-a).

### **Determination of Prevailing Wage and Supplement Rate Updates Applicable to All Counties**

The wages and supplements contained in the annual determination become effective July 1st whether or not the new determination has been received by a given contractor. Care should be taken to review the rates for obvious errors. Any corrections should be brought to the Department's attention immediately. It is the responsibility of the public work contractor to use the proper rates. If there is a question on the proper classification to be used, please call the district office located nearest the project. Any errors in the annual determination will be corrected and posted to the NYSDOL website on the first business day of each month. Contractors are responsible for paying these updated rates as well, retroactive to July 1st.

When you review the schedule for a particular occupation, your attention should be directed to the dates above the column of rates. These are the dates for which a given set of rates is effective. To the extent possible, the Department posts rates in its possession that cover periods of time beyond the July 1st to June 30th time frame covered by a particular annual determination. Rates that extend beyond that instant time period are informational ONLY and may be updated in future annual determinations that actually cover the then appropriate July 1st to June 30th time period.

### **Withholding of Payments**

When a complaint is filed with the Commissioner of Labor alleging the failure of a contractor or subcontractor to pay or provide the prevailing wages or supplements, or when the Commissioner of Labor believes that unpaid wages or supplements may be due, payments on the public work contract shall be withheld from the prime contractor in a sufficient amount to satisfy the alleged unpaid wages and supplements, including interest and civil penalty, pending a final determination.

When the Bureau of Public Work finds that a contractor or subcontractor on a public work project failed to pay or provide the requisite prevailing wages or supplements, the Bureau is authorized by Sections 220-b and 235.2 of the Labor Law to so notify the financial officer of the Department of Jurisdiction (Contracting Agency) that awarded the public work contract. Such officer MUST then withhold or cause to be withheld from any payment due the prime contractor on account of such contract the amount indicated by the Bureau as sufficient to satisfy the unpaid wages and supplements, including interest and any civil penalty that may be assessed by the Commissioner of Labor. The withholding continues until there is a final determination of the underpayment by the Commissioner of Labor or by the court in the event a legal proceeding is instituted for review of the determination of the Commissioner of Labor.

The Department of Jurisdiction (Contracting Agency) shall comply with this order of the Commissioner of Labor or of the court with respect to the release of the funds so withheld.

### **Summary of Notice Posting Requirements**

The current Prevailing Rate Schedule must be posted in a prominent and accessible place on the site of the public work project. The prevailing wage schedule must be encased in, or constructed of, materials capable of withstanding adverse weather conditions and be titled "PREVAILING RATE OF WAGES" in letters no smaller than two (2) inches by two (2) inches.

The "Public Work Project" notice must be posted at the beginning of the performance of every public work contract, on each job site.

Every employer providing workers' compensation insurance and disability benefits must post notices of such coverage in the format prescribed by the Workers' Compensation Board in a conspicuous place on the jobsite.

Every employer subject to the NYS Human Rights Law must conspicuously post at its offices, places of employment, or employment training centers, notices furnished by the State Division of Human Rights.

Employers liable for contributions under the Unemployment Insurance Law must conspicuously post on the jobsite notices furnished by the NYS Department of Labor.

## **Apprentices**

Employees cannot be paid apprentice rates unless they are individually registered in a program registered with the NYS Commissioner of Labor. The allowable ratio of apprentices to journeyworkers in any craft classification can be no greater than the statewide building trade ratios promulgated by the Department of Labor and included with the Prevailing Rate Schedule. An employee listed on a payroll as an apprentice who is not registered as above or is performing work outside the classification of work for which the apprentice is indentured, must be paid the prevailing journeyworker's wage rate for the classification of work the employee is actually performing.

NYSDOL Labor Law, Article 8, Section 220-3, require that only apprentices individually registered with the NYS Department of Labor may be paid apprenticeship rates on a public work project. No other Federal or State Agency of office registers apprentices in New York State.

Persons wishing to verify the apprentice registration of any person must do so in writing by mail, to the NYSDOL Office of Employability Development / Apprenticeship Training, State Office Bldg. Campus, Bldg. 12, Albany, NY 12240 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.

## 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.

#### 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. In most cases the payment or provision of supplements is for each hour worked (noted in the schedule as 'Per hour worked'). Some classifications require the payment or provision of supplements for each hour paid (noted in the schedule as 'Per hour paid'), which require supplements to be paid or provided at a premium rate for premium hours worked. Some classifications may also require the payment or provision of supplements for paid holidays on which no work is performed.

#### 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.state.ny.us](http://www.labor.state.ny.us)) for current wage rate information.

#### 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 12240

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

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L05/07/09

## QUANTITY SHEET SUMMARY FOR PROPOSAL

CONTRACT ID: D263340

PROJECT(S): 780552

CONTRACTOR : \_\_\_\_\_

SEC	ITEM			
NUM	NUMBER	DESCRIPTION	UNIT	QUANTITY
0001	201.07	CLEARING AND GRUBBING	ACRE	0.200
0001	203.02	UNCLASSIFIED EXCAVATION AND DISPOSAL	CY	1060.000
0001	203.06	SELECT FILL	CY	389.000
0001	203.07	SELECT GRANULAR FILL	CY	55.000
0001	206.0201	TRENCH AND CULVERT EXCAVATION	CY	24465.000
0001	206.05	TEST PIT EXCAVATION	EACH	4.000
0001	207.20	GEOTEXTILE BEDDING	SY	140.000
0001	207.21	GEOTEXTILE SEPARATION	SY	4890.000
0001	209.1003	SEED AND MULCH - TEMPORARY	SY	10076.000
0001	209.110102	CHECK DAM (DITCH BOTTOM WIDTH > 3' TO 6'), STONE-TEMP	EACH	62.000
0001	209.110104	CHECK DAM (DITCH BOTTOM WIDTH > 10'), STONE-TEMPORARY	EACH	3.000
0001	209.13	SILT FENCE-TEMPORARY	LF	25000.000
0001	209.190201	ROLLED EROSION CONTROL PRODUCT, CLASS II TYPE B, INTER	SY	3325.000
0001	304.12	SUBBASE COURSE, TYPE 2	CY	132.000
0001	402.000013	PLANT PRODUCTION QUALITY ADJUSTMENT TO HMA ITEMS	QU	1.000
0001	402.098303	9.5 F3 TOP COURSE HMA, 80 SERIES COMPACTION	TON	4.000
0001	402.198903	19 F9 BINDER COURSE HMA, 80 SERIES COMPACTION	TON	5.000
0001	402.378903	37.5 F9 BASE COURSE HMA, 80 SERIES COMPACTION	TON	7.000
0001	552.17	SHIELDS AND SHORING	SF	438212.000
0001	603.051014	CORRUGATED STEEL PIPE (2-2/3 IN. X 1/2 IN.) CORRUGATI	LF	30.000
0001	603.051414	CORRUGATED STEEL PIPE (2-2/3"X1/2") CORRUGATIONS)24 I	LF	30.000

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CONTRACT ID: D263340

PROJECT(S): 780552

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SEC NUM	ITEM NUMBER	DESCRIPTION	UNIT	QUANTITY
0001	603.171016	GALVANIZED STEEL END SECTIONS-PIPE (2-2/3" X 1/2" CORR EACH		2.000
0001	603.171416	GALVANIZED STEEL END SECTIONS-PIPE (2-2/3" X 1/2" CORR EACH		2.000
0001	603.541414	CORRUGATED ALUMINUM END SECTIONS, PIPE 24 INCH DIAMETER EACH		2.000
0001	603.9824	SMOOTH INTERIOR CORRUGATED POLYETHYLENE CULVERT AND S LF		30.000
0001	604.10	PREFABRICATED ADJUSTMENT RINGS FOR MANHOLES	EACH	1.000
0001	604.4048	ROUND PRECAST CONCRETE MANHOLE TYPE 48	LF	8.400
0001	607.41010010	TEMPORARY PLASTIC BARRIER FENCE	LF	6500.000
0001	608.020102	HOT MIX ASPHALT (HMA) SIDEWALKS, DRIVEWAYS AND BICYCLE TON		42.000
0001	608.020112	PLANT PRODUCTION QUALITY ADJUSTMENT TO 608.020102	QU	1.000
0001	610.1401	TOPSOIL - REUSE ON-SITE MATERIALS	CY	9689.000
0001	610.1601	TURF ESTABLISHMENT - ROADSIDE	SY	10451.000
0001	611.0351	PLANTING - CONIFEROUS TREES - 5 FOOT HEIGHT BALL & BU EACH		3.000
0001	611.0451	PLANTING DECIDUOUS SHRUBS - 3 FOOT HEIGHT/SPREAD BALL EACH		6.000
0001	617.01010024	CONTROLLING INVASIVE PLANT SPECIES WITH HERBICIDES	SF	16470.000
0001	617.10000024	DISPOSAL OF MATERIAL CONTAINING INVASIVE PLANT SPECIES	CY	81.000
0001	617.11000024	EQUIPMENT CLEANING FOR INVASIVE PLANT SPECIES	LS	1.000
0001	619.01	BASIC WORK ZONE TRAFFIC CONTROL	LS	1.000
0001	620.04	STONE FILLING (MEDIUM)	CY	4.000
0001	623.12	CRUSHED STONE (IN-PLACE MEASURE)	CY	5.000
0001	625.01	SURVEY OPERATIONS	LS	1.000
0001	625.03	CONCRETE RIGHT OF-WAY-MARKERS TYPE H (HIGH)	EACH	4.000

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CONTRACT ID: D263340

PROJECT(S): 780552

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SEC	ITEM			
NUM	NUMBER	DESCRIPTION	UNIT	QUANTITY
0001	625.110001	SURVEY GRADE GPS INSPECTION UNIT	EACH	1.000
0001	627.50140008	CUTTING PAVEMENT	LF	110.000
0001	637.01	LABORATORY BUILDING	EACH	1.000
0001	637.12	ENGINEER'S FIELD OFFICE - TYPE 2	MNTH	13.000
0001	637.34	OFFICE TECHNOLOGY AND SUPPLIES	DC	5000.000
0001	637.36	CONSTRUCTION TESTING SUPPLIES - CONSUMABLES	DC	100.000
0001	655.1202	MANHOLE FRAME AND COVER	EACH	1.000
0001	660.61000325	REIMBURSEMENT TO VERIZON FOR FURNISHING UTILITY SERVI	DC	4000.000
0001	660.61000925	REIMBURSEMENT TO NYSEG FOR FURNISHING UTILITY SERVICE	DC	4000.000
0001	660.78040010	HDPE PIPE BY DIRECTIONAL DRILLING, 4 NPS	LF	68.000
0001	660.78060010	HDPE PIPE BY DIRECTIONAL DRILLING, 6 NPS	LF	1612.000
0001	660.81000007	HOLD UTILITY POLE IN PLACE	EACH	77.000
0001	662.05000001	FURNISH TELEPHONE SERVICE	LS	1.000
0001	662.60000108	FURNISHING ELECTRICAL SERVICE	DC	1000.000
0001	662.60000208	FURNISHING ELECTRICAL SERVICE	DC	1000.000
0001	662.60000308	FURNISHING ELECTRICAL SERVICE	DC	1000.000
0001	663.10010107	PACKAGED BOOSTER WATER PUMPING STATION	LS	1.000
0001	663.10020107	PACKAGED HYDROPNEUMATIC/RE-CHLORINATION STATION	LS	1.000
0001	663.10030107	PACKAGED PRESSURE REDUCING VALVE VAULT	EACH	1.000
0001	663.1004	RESILIENT WEDGE VALVE & VALVE BOX, 4"	EACH	2.000
0001	663.10040107	RESIDENTIAL PRESSURE REDUCING VALVE	EACH	20.000

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PROJECT(S): 780552

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SEC NUM	ITEM NUMBER	DESCRIPTION	UNIT	QUANTITY
0001	663.10050007	BLOW-OFF HYDRANT	EACH	5.000
0001	663.1006	RESILIENT WEDGE VALVE & VALVE BOX, 6"	EACH	18.000
0001	663.10060007	AIR RELEASE VALVE ASSEMBLY	EACH	1.000
0001	663.10070007	WATER METERS AND REMOTE READ SYSTEM	LS	1.000
0001	663.10080007	RESIDENTIAL WATER PLUMBING CONNECTION	EACH	19.000
0001	663.161208	TAPPING SLEEVE, VALVE & VALVE BOX ASSEMBLY, 12" X 8"	EACH	1.000
0001	663.1804	BOLTED SLEEVE TYPE COUPLING, 4"	EACH	1.000
0001	663.1806	BOLTED SLEEVE TYPE COUPLING, 6"	EACH	15.000
0001	663.2001	IRON WATER MAIN FITTINGS (3" - 8")	LB	2093.000
0001	663.2106	WEDGE TYPE MECHANICAL RESTRAINT GLANDS, 6"	EACH	9.000
0001	663.2504	WATER SERVICE CONNECTION, 1"	EACH	79.000
0001	663.2506	WATER SERVICE CONNECTION, 1 1/2"	EACH	4.000
0001	663.50000017	INSTALLING WATER SUPPLY UTILITIES BY DIRECTIONAL DRILL	LF	2170.000
0001	683.92211208	FIBER OPTIC CABLE - 12 FIBERS	LF	11200.000
0001	697.03	FIELD CHANGE PAYMENT	DC	180000.000
0001	698.04	ASPHALT PRICE ADJUSTMENT	DC	100.000
0001	698.05	FUEL PRICE ADJUSTMENT	DC	736.000
0001	698.06	STEEL/IRON PRICE ADJUSTMENT	DC	100.000
0001	699.040001	MOBILIZATION	LS	1.000
0001	203.250000AA	SAND BACKFILL	CY	6668.000
0001	663.040400AA	PLASTIC WATER PIPE, 4"	LF	3750.000

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PROJECT(S): 780552

CONTRACTOR : \_\_\_\_\_

SEC	ITEM				
NUM	NUMBER	DESCRIPTION	UNIT	QUANTITY	
0001	663.040600AA	PLASTIC WATER PIPE, 6"	LF	25232.000	
0001	663.040800AA	PLASTIC WATER PIPE, 8"	LF	235.000	
0001	663.070400AA	POLYETHYLENE WATER SERVICE PIPE, 1"	LF	3785.000	
0001	663.070600AA	POLYETHYLENE WATER SERVICE PIPE, 1 1/2"	LF	335.000	
0001	203.070000AB	SELECT GRANULAR FILL	CY	4146.000	
0001	623.120000AB	CRUSHED STONE (IN-PLACE MEASURE)	CY	2522.000	
0001	663.010400AB	DUCTILE IRON CEMENT LINED WATER PIPE, 4"	LF	3750.000	
0001	663.010600AB	DUCTILE IRON CEMENT LINED WATER PIPE, 6"	LF	25232.000	
0001	663.010800AB	DUCTILE IRON CEMENT LINED WATER PIPE, 8"	LF	235.000	
0001	663.060400AB	COPPER WATER SERVICE PIPE 1"	LF	3785.000	
0001	663.060600AB	COPPER WATER SERVICE PIPE 1 1/2"	LF	335.000	

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