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ADDENDUM NO. 1

August 15, 2013

QUESTION RESPONSE PROCEDURE

1. All questions must be in writing, and must be faxed to Levi Zemak, Larson Design Group at 607-936-7086 or email to ltz@larsondesigngroup.com.

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Contract 1 – Water System Improvements: $2,300,000 to $2,500,000

CHANGES TO CONTRACT DOCUMENTS

The attention of the Bidders is directed to the following changes to the Contract Documents:

PROJECT MANUAL

Sections to be Replaced

444400 – Treatment Building
445000 – Glass – Lined Bolted Steel Water Storage Tank – AWWA D-103 Type

New Specifications

Division 00 – General Requirements
   a. ADD (Attached) Radio Path Survey

Sections to be Amended

1. Section 444020 – Water Meter Installation
   a. ADD line 2.2.A.5 to read "Size Designation – 5/8" "
   b. ADD line 2.2.A.6 to read "Coupling nut and spud thread – 3/4"

2. Section 332100 – Water Supply Well
   a. AMEND Section 2.2.D.8. to read, "Phases: 3."

CONSTRUCTION DRAWINGS

Drawings to be Replaced - none

New Drawings – S-1 and S-2.

Drawings to be Amended - none

QUESTIONS

1. Q: Pertaining to the proposed SCADA system, specifically section 446000, there are controls and instrumentation listed. Are these to be included with the pre-fab treatment building manufactures quote?
   A: *These components can be supplied with the pre-fabricated building or separate.*

2. Q: The transducer, switch, control panels, OIT's, SCADA programming software, and the related SCADA programming services, are not explicitly defined and clarification would be appreciated.
   A: *Reference replaced specification section 444400 for additional information on these components.*

3. Q: In regards to the communication equipment: antenna's, radio's, towers, mounts, etc. more specification would be appreciated.
   A: *Based on information provided in the attached Radio Path Survey, specific antenna, radio, towers and mounts are to be provided to facilitate communication between the tank site and treatment building.*

4. Q: Is there a completed path study or documents available that would verify a utility pole is of sufficient height for the booster station communication?
   A: *Yes, refer to attached Radio Path Survey.*

5. Q: All PLC specification, purchasing, and programming is to be done by the prefabricated treatment building manufacturer. Is this correct?
   A: *The PLC is an integral part of the treatment building and its operation. To ensure sole source responsibility for the completed station the building manufacturer will be providing the PLC with the building.*

6. Q: A Chlorine analyzer is shown on the plans but is not listed in the specifications section.
   A: *Refer to the updated specifications section 444400 – 2.46 for information on the chlorine analyzer.*

End of Addendum 1

RL Stone Company Inc. Representatives & Distributors

2570 Baird Rd. Penfield, NY 14526 Tel: 585-203-1222 Fax: 585-203-1226

Radio Path Survey Report

Date of Survey: ____2/20/13_____

Name/Employer of Individual(s) doing Survey_____Josh Murray _____

Project: Village of Canaseraga, NY – Water Tank and (2) Pump Station communication

Instrument Manufacturer: ___Phoenix Contact – Spread Spectrum Radio _____

Instrument Model Numbers: _All Equipment is Phoenix Contact. The product used is a kit made by Phoenix consisting of a one way transmission set of 900 mhz frequency hopping spread spectrum radios. The radios have 1 watt of power. The Transmitter side is 24vdc powered and uses a line voltage power supply converter. The Receiver is 12 vdc powered and used a rechargeable battery to allow portability. The receiver has a display readout on it, which indicates the strength of the RF link, in voltage. Phoenix recommends a voltage of 2.50 volts to achieve reliable communication.

Transmitter Equipment: Radio P/N: 2867076 with 20' of LMR400 antenna cable. A 1 dB gain Omni Whip antenna was used.

Receiver Equipment: Radio P/N:2867074 with 6' of RG213 antenna cable. A 6.5 dB Gain yagi antenna was used.

Contact: Levi Zemak, Bud Roszel with Larson Design Group

Remarks: A Path survey was done on 3 separate paths within the village of Canaseraga. The Radio Transmitter (P/N: 2867076) was placed with the 1 dB gain Omni Antenna and 20' of LMR400 cable on the top of the water tank. The Radio Receiver (P/N: 2867047) was used with 6' of RG213 cable and a 6.5dB gain Yagi antenna. The town bucket truck was used to elevate the receiver up to 28' in the air, where survey voltage readings were recorded.

Point 1 (Water Tank): Located @ Latitude 42°27'17.36"N Longitude 77°46'24.42"W

Point 2 (Ball Field Well): Located @ Latitude 42°27'49.55"N Longitude 77°46'21.84"W

Point 3 (Park Well): Located @ Latitude 42°27'28.09"N Longitude 77°46'54.11"W

Path Tank to Ball Field Well

A Voltage of 2.41 volts was recorded with the bucket at maximum height of 28'. With the bucket at a height of 18' the reading was 2.20 volts.

Path Tank to Park Well

A Voltage of 3.25 volts was recorded with the bucket at maximum height of 28'. With the bucket at 18' the reading was 3.10 volts.

Path Ball Field Well To Park Well

For this path survey the transmitter was moved from the tank location to a light pole near the ball field well head. The light pole was approximately 20' tall. The Omni antenna was secured to the light pole. The receiver was then lifted to 28' at the Park well location using the bucket truck.

A Voltage of 2.12 volts was recorded with the receiver at 28' and the transmitter at 20' elevation.

Communication:

At all locations the communication would be improved by raising the elevation of the antennas. Additionally increasing the gain on the antennas would also help with communication. This survey was done in February, with no leaves on the trees and should be considered when selecting mounting heights and antennas.

_____

Name of Technician

_____

Date

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DIVISION 44 – PROCESS EQUIPMENT

SECTION 444400 – TREATMENT BUILDING
FACTORY-BUILT CHEMICAL FEED STATION

PART 1: GENERAL

1.1 SCOPE OF WORK

A. The contractor shall furnish and install one (1) - factory built, factory delivered, above-ground chemical feed station in a modular building with base frame on a structural base with all necessary internal piping, valves, fittings, supports, meters, VFD's and other necessary appurtenances as shown on the plans and specified herein.

B. The station shall be complete when delivered and will not require internal contractor construction except to install the power service through the service conduit provided for that purpose and to connect the main water service to the required points and other work as may be listed in the Section for CONTRACTORS INSTALLATION REQUIREMENTS.

1.2 MANUFACTURER'S RESPONSIBILITY FOR PERFORMANCE

A. The Specifications and Drawings for the Factory-built equipment do not necessarily include all the details for the design and fabrication for the factory-built equipment. The Drawings are generally schematic but the specifications do call out strict requirements to known methods, components and assemblies that must be in a full, complete and functional pumping station. As such, the Manufacturer shall accept and hold complete responsibility for the functionality of the pump station and its workings.

1.3 ACCEPTABLE MANUFACTURER

A. Engineered Fluid, Inc. Centralia, Illinois or Usemco Tomah, Wisconsin are acceptable manufactures of the treatment building.

1.4 ALTERNATE MANUFACTURERS

A. Alternate manufacturers may propose on the equipment set forth in these documents provided these alternate manufacturers take no exceptions to the contract documents and these manufacturers provide the PRE-BID SUBMITTAL information so listed in this specification.

B. Alternate manufacturers are eligible to provide contractor proposals for this equipment. However, these listed manufacturers must have provided a PRE-BID SUBMITTAL to the Engineer of Record at least ten (10) days prior to the bid date.

1.5 PRE-BID SUBMITTAL DOCUMENTS

A. Along with the requirements for post bid submittal documents provided for elsewhere in these documents, all alternate manufacturers offering equipment proposals, without exception, for this equipment shall provide at least ten (10) days before the bid date the below-listed PRE-BID SUBMITTAL documents for the pump station and containing at a minimum:

1. "D" sized only, station mechanical drawing sheets fully to scale and fully annotated showing;
   a. A PLAN VIEW of all mechanical equipment, piping and devices necessary to system operation

and with NEC Electrical Clearances;
b. A lengthwise SECTION VIEW;
c. A Sidewise SECTION VIEW;
d. A complete STRUCTURAL PLAN VIEW of the steel base for the pump stations.

2. "D" sized only sheets showing;
a. A POWER ONE LINE DIAGRAM annotated and showing all power components;
b. A PROCESS & INSTRUMENTATION DIAGRAM (P&ID) showing all components, devices and circuit for the controls and instrumentation for the control and monitoring equipment including the PLC equipment.

3. A detailed drawing of the buildings to be used to house the station(s) including anchoring and assembly methods.

4. An affidavit signed by an officer of the station manufacturer attesting to the fact that the building and building manufacture intended for use on this project has in the past obtained State of New York Certification for the exact building to be provided.

B. PRE-BID SUBMITTAL documents will not be accepted after the date set so it is the Bidding Contractors responsibility to determine which of the listed manufacturers have turned in their PRE-BID SUBMITTAL documents.

C. The Engineer of Record shall review the PRE-BID SUBMITTALS for adherence to the contract documents.

D. The PRE-BID SUBMITTAL shall be provided in One (1) hard paper copy bound in a three ring binder with a Table of Contents and tabs for each individual station and with One (1) electronic copy on CD placed inside the three ring binder in a suitable pocket.

E. The manufacturers that are approved for proposing on the specified equipment, the approval of their PRE-BID SUBMITTAL in no way excuses them from providing a full set of submittal documents being in full conformance to the contract documents for detailed review by the Engineer post bid.

1.6 POST BID SUBMITTAL

A. Equipment submittals shall be bound and in a minimum of three (3) hard paper copy bound and two (2) electronic copies on CD. The submittals shall contain a minimum of three (3) full size drawings, size 24" x 36"; one (1) each covering the station and the electrical control schematic. The station drawing shall be specific to this project, in at least three (3) different views, be to scale and illustrate the National Electrical Code (NEC) clearances per Section 110-26 of the Code. The submittal booklets will be complete with data sheets covering all major components that make up the station and the ETL file number under which the manufacturer is listed, service department personnel statement as detailed in the specifications and be complete with the manufacturer's formal warranty policy.

B. Two (2) submittal reviews of this item will be accomplished at no cost to the submitting contractor. However, all subsequent reviews will be charged to the submitting contractor at the design engineer's standard hourly billing rate.

1.7 QUALITY ASSURANCE

A. The equipment furnished shall be designed, constructed, and installed in accordance with the best practices and methods and shall operate satisfactorily when installed as shown on the contract drawings and operated per manufacturer's recommendations.

1.8 SHIPPING AND DELIVERY

A. The specified equipment shall be delivered by the manufacturer to the site and thereby the station manufacturer shall hold the full responsibility for the condition and completeness of the equipment upon its delivery.

B. The Engineer shall hold the right to inspect the equipment prior to unloading and setting so as to assure the quality and condition of the equipment is in no way deficient.

C. If in the view of the Engineer or Engineer's inspector, the equipment is deficient when delivered, delivery shall be refused.

1.9 SPECIFIED COMPONENTS

A. Within the body of this specification and on the drawings, certain components are listed by name and/or model number for at least One (1) manufacturer's specific product. As such, no "OR EQUAL" is listed or allowed where at least the one manufacturer is listed.

B. These listed components have been chosen because of the Engineer's and Owner's knowledge of and experience with these listed components.

C. No other components other than those listed are acceptable.

1.10 FACTORY START-UP AND TRAINING SERVICE

A. Without exception, the station manufacturer is directly responsible for station start-up and operator training. Third party contractors, agents or representatives are not to be allowed to start up the station nor the equipment therein. As such;

1. Start-up Factory Service Technician shall be a regular employee of the station manufacturer.

2. The manufacturer shall be provided two (2) copies of the complete Operation & Maintenance Manual in electronic form.

1.11 MANUFACTURER'S WARRANTY

A. The warranty is the sole responsibility of the station manufacturer and that manufacturer's warranty shall be provided in written form, being placed in both the Submittal documents covering the specified equipment and the O&M manuals provided with that equipment.

B. It is required the station warranty provide the Owner with a single source responsibility for all components specified herein and the system as a whole. That single source shall be none other than the station manufacturer. Third party suppliers, service contractors, "Pass-through" warranties and service by the representative are not acceptable.

C. Said manufacturer's warranty shall at a minimum cover:

1. A period of one (1) year commencing upon successful start-up, after authorized manufacturer's start-up, not to exceed eighteen (18) months from the date of shipment.

2. The warranty period shall be inviolate regardless of any component manufacturer's warranty for equipment and components within the station.

3. The manufacturer's warranty shall cover all equipment, components and systems provided in or with the station by the manufacturer of the station, exclusive of those components supplied by and/or installed by others independent of the manufacturer of record for this station.

4. The warranty shall provide for the station manufacturer to bear the full cost of labor and materials for replacement and/or repair of faulty or defective components so there shall be no cost incurred by the Owner for this work during the warranty period.

5. The manufacturer's warranty policy is amended only by the items considered consumable, i.e., light bulbs, pump seals, pump packing, lubricants and other maintenance items consumed by usage.

6. No assumption of contingent liabilities for any component failure during manufacturer's warranty is made.

7. The warranty pertains only where the equipment has been operated in strict accordance with the manufacturer's instructions and requirements. Evidence of misuse or modification to the equipment voids the warranty.

D. If the submitted written manufacturer's warranty does not meet the minimum requirements set forth above, that submittal will forthrightly be rejected.

PART 2 - ON-GRADE EQUIPMENT BUILDING

2.1 BUILDING DESIGN CRITERIA

A. The station building enclosure shall be a factory assembled, modular structure of two (2) compartment(s) all attached to the station base structure and requiring no additional assembly at the job site.

B. The building design criteria shall be: (1.) To withstand snow load based on ASCE 7-05 Ground Snow Loads for the state and county of installation (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 IBC 2006 and 2009 established by zip code and a live floor load of 125 PSF.

C. 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.

D. The building specified shall be of the size shown on the drawings. Building sizes less than those shown will not be allowed.

2.2 BUILDING CONSTRUCTION

A. The materials specified are specifically chosen to be resistant to moisture degradation and infestation and to be maintainable.

B. Insulation values for the walls and roof structure shall be a minimum R-21 in the walls and the roof. The insulation shall have an ASTM E-84 flame spread index of 25 and smoke developed of 450.

C. 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 plywood sheathing requiring no fasteners. Corner moldings of like FRP material shall be installed & finished in a workmanlike manner.

D. 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.

E. The building shall be warranted by the station manufacturer for a period of ten (10) years from the date of delivery. Warranty shall warrant replacement (at no cost to owner) of any faulty or defective building materials and equipment.

2.3 MOUNTING AND FASTENING

A. The building shall be fabricated up from and securely attached to a framework fabricated of 2" x 8" 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. To hold the building framing to the 2" x 8" base frame, 5/8" anchor studs will be welded to the base frame. In assembling the building framing to the base frame a 3 1/4" x 4" x 1/4" thick anchor plate under a flat washer, lock washer and 5/8" nut shall be used to fasten the building framing to the framing base as shown. The base frame shall be grit blasted to a SP-6 finish and coated with the specified coating material.

B. The building enclosure shall be firmly and securely attached to the steel base structure by lag bolting from inside the station, through evenly spaced 9/32" holes pre-drilled into a 2" by 1-1/2" by 1/8" thick angle piece that has been continuously welded to the steel floor. The lag bolts shall screw into the 2" x 8" tubular base frame upon which the building has been built.

C. The lag bolts shall be plated steel, size 5/16" diameter x 2" long. The number and location of the lag bolts shall be as determined by structural analysis so as to maintain the live load and wind load ratings as specified and to resist shearing and tearing in the process of transporting and placing the finished station.

2.4 EXTERIOR TREATMENT-FINE AGGREGATE FINISH

A. The exterior wall faces of the building shall be finished by having all joints, cracks and imperfections of the exterior plywood sheathing filled by troweling with polyester resin and hardener and upon setting, sanded smooth prior to finishing.

B. All corners and edges and face joints of the plywood sheathing shall milled smooth to a minimum 1/2" radius prior to fiberglass application.

C. The building exterior shall be sprayed with one coat of Gelcoat resin followed by a second coating of Gelcoat resin containing small aggregate to produce a sand finish of "Stone Taupe" color.

2.5 METAL ROOF SYSTEM

A. The 9/16" USF decking sheathing shall be covered with a 26 gauge metal panel system to form a standing seam roof as shown. The panels shall have a Galvalume® substrate with a Kynar 500® finish. The panels shall meet UL Standard 2218, Class 4 impact resistant and Class A fire resistant rating. The system shall be complete with fascia and soffit. The minimum roof slope shall be 3:12.

B. The ridgeline of the roof shall be covered end to end with a broken edge panel open along the sides to create a roof vent along both sides of the entire ridge line. The top of the broken edge panel along the ridge line shall

cover over the top of the standing seams to provide a finished appearance.

C. Roof color shall be green.

2.6 FACTORY INSTALLED TRUSSED ROOF SYSTEM

A. The building manufacturer shall provide Wooden roof trusses, plywood sheathing, underlaying felt to be factory applied and be covered by the finished roof surface which shall be factory applied to the building to form a hipped roof system as shown.

B. When installed, the trusses shall be covered by 1/2" thick C-C Grade plywood. The selected roof material shall be called out in these specifications

C. Metal Facia and Soffits shall be installed on the building by the building manufacturer. These materials for the facia and soffit shall be complimentary in color and texture and approved by the Engineer.

D. A ridge line, metal airvent system shall be installed as a part of the roof.

2.7 BUILDING SUBSTRUCTURE

A. 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.

B. 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.

C. 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.

D. On the substructure on the floor plate, indented approximately 6”/8”,there shall be welded a 1-1/2” x 2” x 1/8” steel angle iron with drilled holes. This angle steel piece shall be the bracket through which the building is attached to the base substructure.

2.8 SKID INSULATION

A. 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 a ASTM E-84 flame spread rating of less than 30.

2.9 FLOORDRAIN(S)

A. The station shall have floor drains as shown on the drawing.

B. 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.

2.10 PIPING FLOOR PENETRATIONS

A. 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.

B. 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.

2.11 SAFETY FLOOR MATTING

A. The walkway areas (that space from the entrance ladder to the control panel and the entire NEC clearance area) 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 raise knob design to permit aeration and drainage, and to reduce runner fatigue. The runner shall not be glued to the floor.

2.12 PIPING-TRANSMISSION

A. 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.

B. 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.

1. The piping sizes shall be as shown on the drawing.

2. Size 10 inch and below - Schedule 40

3. Size 12 inch thru 20 inch - Standard weight (.375" wall)

4. Size 24 inch and above - Standard weight (.500" wall)

2.13 PIPE WELDING

A. All pipe welds shall be performed by certified welders employed by the pump station manufacturer. As part of the equipment submittal, the pump station manufacturer shall provide copies of the welding certificates of the employees who are to perform the pipe welds.

B. Shop welders shall be certified in accordance with ASME BPVC Section IX or AWS D1.1. Certification shall be done by an independent testing laboratory giving certification for the weld positions for which the tests were performed.

2.14 PIPE SURFACE PREPARATION

A. All piping inside and outside surfaces shall be prepared by grit blasting, or other abrasive blasting, prior to any welds taking place to minimum SP-6 finish.

2.15 PIPE CUTTING

A. Piping of 4" diameter and smaller may be cut by saw.

B. Piping of 6" diameter and larger shall be bevel cut, and Oxyfuel or Plasma-arc cutting techniques shall be used to assure and facilitate bevel pipe cuts.

2.16 SADDLE CUTS AND WELDS

A. Saddle cuts in pipe made in preparation for a saddle weld of a pipe at an angle to a pipe shall be made with numerically controlled, plasma cutting machines. Similarly, saddle end cuts to pipes to make a saddle mating piece shall be done with the same numerically controlled plasma cutting equipment.

B. When the two saddle cut pieces are mated and welded with the MIG process, the internal finished weld shall be smooth and free of inclusions, crevices and other corrosion sites.

2.17 PIPE WELDING TECHNIQUES

A. Pipe welds shall be performed by metal added, inert gas shielded arc welding (MIG) techniques wherein the weld heat settings, the wire feed speed and the traverse speed of the work below the welding are numerically set to assure proper weld fusion and penetration and repeatable welds.

B. In all cases, short circuit transfer, spray transfer or pulse-arc transfer modes of the gas metal arc welding process shall be used.

C. When utilizing the short circuit mode, shielding gas consisting of 50% carbon dioxide and 50% argon gas shall be used. When utilizing the spray or pulse-arc transfer modes, a shielding gas consisting of 5% carbon dioxide and 95% argon shall be used.

D. In all cases, welding wire with a minimum tensile strength of 70,000 psi shall be employed.

E. All flange welds and butt welds of equal size pipe shall be a single continuous nonstop weld around the complete circumference of the pipe. Whenever possible, vertical up weld passes will be applied to all pipe welds. No vertical down weld passes will be allowed.

F. Completed pipe welded assemblies shall create no internal obstruction, restriction or create any unintended sources of water deflection.

G. Piping of six (6) inch diameter and larger shall require a minimum of two (2) weld passes to complete each weld. The first pass, or root pass, shall be applied at the bottom of the bevel cut using the short circuit transfer welding mode, and the second pass, or cap pass, shall be applied over the root pass using the spray or pulse arc transfer welding modes to insure that at a minimum the total weld thickness shall be equal to thinnest of the two pieces being welded together.

H. The pipe shall be sand blasted, as specified elsewhere, before pipe weld and after pipe weld, before fusion bonded epoxy is applied.

2.18 WELD STANDOFFS

A. No welding shall be performed on fusion bonded coated piping after the coating process has been performed.

B. Where any piping is to be welded after the application of fusion bonded epoxy coating to the inside of the pipe, at the point of the weld, a weld standoff must be welded to the pipe prior to the coating. The weld shall be made to the standoff and not onto the pipe.

2.19 PIPE SUPPORTS

A. Pipe supports by minimum sizing for:

1. 8" and smaller 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" and 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 15E 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. Pipe supports are to be fully welded at both end points to the pipe and steel floor where required.

C. 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.

2.20 RISER PIPE VERTICAL SUPPORTS

A. All of the inlet and outlet vertical riser pipes shall be provided each with, two (2) structural steel, angle pipe support welded to the weldment plates on the vertical riser pipe to down to the floor. These supports shall be opposed by at least 120 degrees around the pipe. The minimum member size for these supports shall be 3” x 4” x 1/4” tubular steel.

2.21 FUSION BONDED EPOXY INTERNAL PIPE COATING

A. 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.

B. 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 Table 1 and Table 2 with the exception of Table 2 section 7 per AWWA C-213.

C. The powder coating product shall be National Sanitation Foundation (NSF) Standard 61 certified material.

Test	Requirement	Results
Specific Gravity	1.2 – 1.8	1.37 g/mL
Sieve Analysis	<2.0% on 100 mesh	0.14%
Gel time @ 400˚F	7-150 seconds	25 seconds
Thickness	12-16 mils	12-16 mils
Impact	>100 in/lb	>100 in/lb
Appearance	Smooth & defect free	Smooth, defect free
Bendability	Pass 2.4 inch bend	Pass 1.8 inch bend
Shear Adhesion	>3000 PSI	5300 PSI
Penetration	<10%	8%
Abrasion Resistance	<0.300 grams loss	0.15 gram loss
Water Soak	1-3 Rating	1 Rating
Volume Resistivity	>1.1x10e15	2x10e15
Dielectric Strength	>1000 V/mil	1160 V/mil

D. The epoxy powder coating shall be IF1947T Red Epoxy Coating, latest revision from Valspar, Inc.

E. 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.

2.22 COATINGS - CORROSION PROTECTION

A. All interior and exterior surfaces of the exposed steel structure, transmission piping, and fittings shall be gritblasted 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.

2.23 WELDMENT PRIME COATING

A. 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.

2.24 BASE COATING

A. 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.

2.25 TOP COATING

A. 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.

2.26 POST-ASSEMBLY COATING

A. 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.

2.27 CORROSION PROTECTION – CHEMICAL FEED ROOM FLOOR

A. 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.

2.28 SERVICE CONNECTIONS ON INTERNAL PIPING

A. 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 drawings; no less than the quantity of couplings and adaptors shown shall be allowed.

2.29 RESTRAINING POINTS

A. The main inlet and outlet piping to the station shall each be provided with two (2)/four (4) restraining points as welded on "eyes" or similar device welded to the underside of the base structure framing 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.

2.30 COMPRESSION COUPLINGS

A. The station piping shall include a variety of compression type, flexible coupling 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) or self restrained coupling may be used.

B. Grooved fittings may not be used under any circumstance.

2.31 LINE PRESSURE GAUGES

A. 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 movement shall be rotary; the bourdon tube shall be copper alloy C-type. The gauge shall have a 1/4" MNPT lower mount process connection and contain a 0.6mm copper alloy restrictor. Combination pressure gauge range and scale graduations shall be in psi and feet of water as follows:

B. Gauge ranges shall be established by the Engineer for each of the suction and discharge gauges for each pump station.

C. 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.

D. Gauge ranges, markings and gauge location shall be identified in the submittal documents.

2.32 STATIC AND SENSING LINES

A. 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.

B. 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.

2.33 SAMPLE TAP

A. 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.

2.34 HOSE BIBB WITH VACUUM BREAKER

A. There shall be provided a standard hose bibb with valve and vacuum breaker on the suction piping.

2.35 BALL VALVES

A. 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.

2.36 BUTTERFLY VALVES

A. The butterfly valves shall be provided in accordance with AWWA Standard AWWA C504, latest revision, as (Class 150B, 150 psi working pressure).

B. The wafer body shall be ASTM A126 cast iron for (150) psi working pressure.

C. The valve disk shall be Class B cast iron or ductile iron for 150B valves.

D. Valve seals shall be either seat-on-body or seat-on-disk.

E. Valve shafts shall be through shafts and be of the stainless steel.

F. The valve body shall be coated internally with two-part alkyd epoxy conforming to NSF061.

G. Valves shall be by Pratt, Kennedy Valve or approved equal.

2.37 MANUAL VALVE ACTUATORS

A. Manually operated butterfly valves size 6" and smaller shall be equipped with lever style operators capable of withstanding 450 ft. lbs. of input torque and mounted to the valve trunnion with 4 bolts.

B. Manually operated butterfly valves size 8" and larger shall be equipped with travelling nut style handwheel operators capable of withstanding 450 ft. lbs. of input torque and mounted to the valve trunnion with 4 bolts.

2.38 SWING CHECK VALVES

A. Each pump discharge pipe run shall include a flanged style, swing check valve with outside lever and weight. The body of the check valve shall be cast iron(ASTM-A-126, Class B) construction. The clapper shall be cast iron rubber faced. Hinge pins shall be 18-8 stainless steel rotating bronze plugs. The valve body shall have full flow equal to nominal pipe diameter at all points through the valve. The valve shall be manufactured in accordance with ANSI/AWWA C508 standards. The valve shall be coated inside and out except for bronze machined surfaces in accordance with AWWA Standards.

B. SWING CHECK VALVES SHALL BE M&H 159 or approved equal.

2.39 MAGNETIC FLOWMETER

A. The magnetic flowmeter shall consist of a flow tube, signal cable and remote mounted transmitter to measure flow rate and transmit a proportional electric signal to the telemetry system provided by others.

B. The flow tube shall be size four (4) inch with ANSI B16.5 Class 15, fully rated carbon steel flanged end connections and an elastomer lining material suitable for potable water service. The flowmeter shall be provided with stainless steel electrodes and a general purpose sensor. Two (2) ground rings shall be installed on both ends of the meter. The flowmeter shall include a standard 3-point pressure test.

C. The flowmeter will be provided with a transmitter including 24V dc power supply, 3-line display with keypad, and general purpose enclosure.

D. THE MAGNETIC FLOWMETER SHALL BE ABB Water Master, or approved equal.

2.40 STATIC MIXER

A. The magnetic flowmeter shall consist of a carbon steel housing, 150# carbon steel flanges, and 4 stainless steel mixing elements. The interior of the housing shall be potapox epoxy to provide chemical resistance.

B. THE STATIC MIXER SHALL BE MANUFACTURED BY KOMAX or approved equal.

2.41 WORKBENCH

A. A multi-shift workbench shall be provided. The workbench shall be 60"W x 46"H 30" deep and constructed of 12 gauge steel. the workbench shall include 3 compartments with 1 adjustable shelf.

B. THE WORKBENCH SHALL BE MANUFACTURED BY STRONGHOLD, MODEL 52.10-3MS-303-RS or approved equal.

2.42 EMERGENCY SHOWER/EYE WASH

A. An emergency shower with eye wash shall be installed in the chemical feed room. The unit shall be all PVC construction, 10" shower head, 11.5" eyewash bowl. The unit shall have stainless steel pull actuators. Unit shall comply with ANSI Z358.1-2009. A thermal mixing valve shall be provided between the water heater and the Shower/Eyewash.

B. THE EMERGENCY EYEWASH/SHOWER UNIT SHALL BE A GUARDIAN G1992 or approved equal.

2.43 TANKLESS WATER HEATER

A. A tankless water heater shall be provided sized for the emergency shower and eyewash. The water heater shall operate on 460V, 3 phase power.

B. THE TANKLESS WATER HEATER SHALL BE TANKLESS, INC. C108KW or approved equal.

2.44 SAMPLE SINK

A. The sink shall be a single bowl, compression molded material composed of mineral-filled thermoplastic polymers with fiber reinforcement, finished to a smooth surface. The sink shall be manufactured in accordance with ANSI Z124.3. The sink shall have a nominal 0.25 inch thickness, and dimensions of 25" wide by 22" deep and 9" sink well.

B. Two (2) 5-3/8" spread gooseneck style laboratory faucets will be provided. The faucets shall be metal construction with lever type handle and 1/2" MNPT threaded connection.

C. SAMPLE SINK SHALL BE SWANSTONE MODEL KSSB-2522 or approved equal.

2.45 CHEMICAL FEED SYSTEMS

A. METERING PUMP – Shall be a positive displacement, peristaltic type tubing pump with a variable speed DC motor, non-spring loaded roller assembly located in the pumphead, integral tube failure detection system, and peristaltic pump tubing assembly with attached connection fittings. Flex-Pro A2 model shall be capable of output volumes from 0.02 to 14.9 gallons per hour.

1. There shall be no valves, diaphragms, springs, or dynamic seals in the fluid path. Process fluid shall contact the pump tubing assembly and connection fittings only.

2. Capable of self-priming at the maximum rated pressure of up to 125 PSI (8.6 bar).

3. Capable of running dry without damage.

4. Pump rollers shall be capable of operating in either direction at the maximum rated pump pressure.

5. Pump rollers shall be capable of operating in either direction without output variation.

6. Suction lift shall be 30 feet of water.

7. Pump shall have a two year manufacturer’s warranty that includes chemical damage to the pumphead and roller assembly caused by a ruptured pump tube assembly.

B. PUMPHEAD – Shall be a single, unbroken track with a clear removable cover

1. Tube failure detection sensors shall be wholly located in the pumphead. Tube failure detection system shall not trigger with water contact. Float switch type switches alone shall not be used. Process fluid waste ports or leak drains alone shall not be provided as the sole means of protection.

2. Squeeze rollers with encapsulated ball bearings shall be directly coupled to a one piece thermoplastic rotor. Four polymeric rollers shall be provided; two squeeze rollers for tubing compression shall be located 180 degrees apart and two guide rollers that do not compress the tubing shall be located 180 degrees apart. The roller diameters and occlusion gap shall be factory set to provide the optimum tubing compression; field adjustment shall not be required. Spring loaded or hinged rollers shall not be used.

3. Rotor assembly shall be installed on a D-shaped, chrome plated motor shaft and removable without tools.

4. For tubing installation and removal, rotor assembly shall be rotated by the motor drive at 6 RPM maximum when the pumphead cover is removed. Hand cranking of the rotor assembly shall not be required.

5. Pump head and tubing compression surface shall be corrosion resistant Valox thermoplastic.

6. The pump head cover shall be clear, annealed acrylic thermoplastic with an integral ball bearing fitted to support the overhung load on the motor shaft. Cover shall include an imbedded magnetic safety interlock which will limit the motor rotation speed to 6 RPM when removed.

7. Cover shall be positively secured to the pump head using four thumb screws. Tools shall not be required to remove the pump head cover.

C. PUMP TUBE ASSEMBLY

1. To ensure pump performance and accuracy, only tubing provided by the manufacturer is acceptable.

2. Pump tube shall be assembled to connection fittings of PVDF material.

3. Connection fittings shall be permanently attached to the tubing at the factory. To prevent tubing misalignment and ensure accuracy, fittings shall insert into keyed slots located in the pump head and secured in place by the pump head cover.

4. Connection fittings shall be 1/2” M/NPT. Alternate fittings shall accept 1/4” ID x 3/8” OD flexible tubing.

5. Tube sizes and connections shall be measured in inches.

D. DRIVE SYSTEM – Shall be factory installed and totally enclosed in a NEMA 4X, (IP66) wash-down enclosure. Capable of operating on 110/130VAC 50/60 Hz, or 208/250VAC 50/60 Hz, single phase supply, user configurable via a selection switch located in the junction box.

1. Motor
   a. Reversible, 1/8 HP DC gear motor rated for continuous duty.
   b. Motor shall include overload protection.
   c. The maximum gear motor RPM shall be 130 RPM.

2. Enclosure
   a. Pressure cast aluminum with acidic liquid iron phosphate three-stage clean and coat pretreatment and exterior grade corrosion resistant polyester polyurethane powder coat.
   b. Rated NEMA 4X (IP66).
   c. Provided with 316SS floor/shelf level mounting brackets and hardware. Provide extended height brackets for mounting pump 4.5 inches above grade level.

d. A wiring compartment shall be provided for connection of input/output signal wires and alarm output loads to un-pluggable type terminal block connectors. Terminal board shall be positively secured to the rear of the pump housing by two polymeric screws and fully enclosed by the wiring compartment cover. The terminal board shall not be disturbed by the removal of the wiring compartment cover. Ribbon cables shall not be used in the wiring compartment. Conduit hubs, liquid-tight connectors, connector through holes and tapped holes shall be sized in U.S. inches.

3. THE CHEMICAL FEED PUMPS SHALL BE BLUE WHITE MODEL A2 PERISTALTIC PUMPS.

2.46 CHLORINE ANALYZER – AMPEROMETRIC MONITORING SYSTEM

A. A chlorine analyzer shall be provided for monitoring free residual chlorine. The analyzer shall use an amperometric method for measuring the free chlorine. The analyzer shall use an EPA approved method for chlorine monitoring. The analyzer output shall be used to pace the chlorine injection pump. The analayzer shall meet the following performance requirements.

B. Probe Performance Requirements
   1. pH Compensated for accurate measurement across wide range
   2. Measurement range: 0 to 10 mg/L (ppm) free residual chlorine.
   3. Probe Resolution: ± 0.01 mg/L (ppm)
   4. Initial Polizaritatuion: 1 Hr
   5. Minimum detection limit: 0.01 mg/L (ppm)
   6. Re-Polarization: 10 minutes
   7. T_{30}: 30 seconds

C. Controller Performance Requirements
   1. LCD graphic display with backlight
   2. 2 programmable on/off outputs (5Amp @ 230 VAC rating)
   3. 2 galvanic isolated, programmable 4-20 mA outputs
   4. 2 proportuional, programmable, pulse outputs (0-250 pulses per minute)
   5. 1 serial output for RS232 or RS485
   6. IP65 Enclosure (NEMA 4X)

D. Certifications
   1. CE approved

E. Operational Criteria
   1. Sample flow rate: 10 gallons per hour
   2. Sample pressure: 14.5 psi max pressure
      a. Supplied with pressure reducing valve
   3. Sample temperature: 5 to 40 degrees C
   4. Operating temperature: -10 to 50 degrees C
   5. Operating humidity: 0-95% percent at 40 degrees C maximum

F. Manufacturer – EMEC (basis of Design) or approved equal
   1. Probe: EMEC ECL 3N/10
   2. Flow Cell: EMEC PEF1/E
   3. Controller: EMEC LDCL
   4. System shall be provided as a panel mounted, pre plumbed system

G. Equipment
A. The LDCL controller operates using 115 volt.
B. The system is reagentless and does not require regular chemical changes
D. The LDCL has three feed control operation modes to operate chemical feed pumps.
1. On/off control where the concentration alarm outputs turn the pump on or off when chlorine levels fall below or exceeds acceptable levels.
2. Proportional control where the 4-20 milli-amp output current is scaled to pace the feed pump proportional to the output.
3. Proportional control using a pulse output to vary chemical addition relative to the measured value and the desired set point. Pulses increase the farther away and decrease the closer the value is to the desired set point
1. Standard optically isolated analog output, selectable as 0 to 20 milli-amp or 4 to 20 milli-amp, field programmable over any portion of the analyzer range.
2. Standard alarm output, free voltage contact (programmable)

H. Components

A. Standard equipment:
1. Probe
2. Flow Cell
3. Analyzer
4. Electrolyte solution
5. Panel Mounted
6. Panel includes islolation valve, filter housing and pressure regulator
7. Carbon filter element (for calibration)
8. Spun bound filter element (normal ops)
9. Manual

B. Dimensions
1. 42 inches wide
2. 18 inches high

C. Weight: 20 pounds
D. Connectors:
1. Sample inlet: 1/2" PE tubing connection
2. Sample drain: 1/2" PE tubing

2.47 CHEMICAL STORAGE TANKS

A. There shall be provided two (2) – 55 gallon day tank assembly as Manufactured by Snyder Industries.

B. The day tank shall be vented from the lid and out through the exterior wall of the station using a chemical resistant vent hose of a minimum 1” diameter.

C. The vent line shall be outset beyond the exterior building wall by at least 1” with the opening covered with a stainless steel rain cover, all being securely attached to the building exterior wall.

D. 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 (2) 55 gallon drums of liquid. Pallet must provide at least 110 gallons of spill containment.

E. The pallet and grated cover shall be of a plastic or resin based material unaffected by the prolonged contact with the chemical inside. The pallet and grate shall be washable.

2.48 PRESSURE TESTING

A. When the station plumbing is completed, the pressure piping within the station (including valves, pumps, control valves, and fittings), connections as make up the entire system shall be hydrostatically tested at a pressure of 150 psi or a pressure equal to the lowest test pressure rating of the equipment within the tested system, whichever is lesser pressure. 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.

B. 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.

PART 3 - ELECTRICAL DESIGN, ASSEMBLY & TEST

3.1 APPARATUS & CONTROL PANEL

A. 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 booster pumping 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.

3.2 CONFORMANCE TO BASIC ELECTRICAL STANDARDS

A. 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.

B. 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.

3.3 U.L. LISTING

A. 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.

B. 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.

3.4 E.T.L. LISTING

A. 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.

3.5 EQUIPMENT GROUNDING

A. 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.

B. 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.

3.6 PANEL MOUNTING HARDWARE

A. Metal framing channel and hangers shall be used exclusively for mounting of electrical panels and electrical components except for those specifically designated otherwise.

B. When mounting panels in buildings with ¾" 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.

3.7 ELECTRICAL SERVICE

A. The electrical service provided for this station will be 480 volt, 3 phase, 60 Hertz.

3.8 ELECTRICAL APPARATUS - CONTROL PANEL

A. All circuit breakers, motor starters, time delay relays and control relays shall be incorporated into one (1) NEMA 1 control panel.

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

One (1) Main Breaker, 300 amps;
Two (2) Branch Breakers, one each per pump,
One (1) Branch Breaker, tankless water heater
One (1) Transformer Breaker, Primary Side,
One (1) Transformer Breaker, Secondary Side,
One (1) Phase Monitor Breaker,
Ten (10) Auxiliary Circuit Breakers, as follows:

1. Controls
2. Lights
3. Heater
4. Heater
5. Exhaust Fan
6. Exhaust Fan
7. Convenience Outlets
7. Telemetry
8. Dehumidifier
9. Chemical Equipment
10. Spare
11. Sewage Pump Station

3.9 ELECTRICAL APPARATUS - ADJUSTABLE FREQUENCY DRIVES

A. 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.

B. 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.

C. 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.

D. 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.

E. 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.

F. 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.

G. 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 of decelerate to setpoint without safety tripping or component damage (flying start).

H. 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.

I. 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.

J. 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.

K. 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.

L. 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.

M. 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.

N. 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.

O. All VFD 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) programmable analog inputs shall accept current or voltage signals.

4. Two (2) programmable analog outputs (0-20mA or 4-20mA).

5. Six (6) programmable digital inputs for maximum flexibility in interfacing with external devices.

6. Three (3) programmable digital Form-C relay outputs.

7. Seven (7) programmable preset speeds.

8. Two (2) independently adjustable accel and decel ramps with 1 - 1800 seconds adjustable time ramps.

9. 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.

10. 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.

11. The VFD shall include password protection against parameter changes.

P. 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.

Q. 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.

R. 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.

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

T. THE VARIABLE FREQUENCY DRIVE UNITS SHALL BE ABB MODEL ACH550 or approved equal.

3.11 GENERATOR

A. A propane driven generator shall be supplied for standby power. The generator shall be shipped loose for field installation by the installing contractor. The genset shall be provided in a weatherproof enclosure. Generator shall be capable of continuous operation at 35 KW at 50°C. The output shall be 460 volts, 4 wire, 3 phase, and 60 Hz. Engine shall be 6 cylinder, 4 cycle and liquid cooled. A 220 amp automatic transfer switch shall be included with the generator. It shall be factory mounted inside the pump station.

3.11 ELECTRICAL POWER TRANSFORMER

A. Balanced 115/230 single phase power for the auxiliary circuits within the scope of each booster station shall be obtained by use of a 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. Transformers with aluminum windings are not acceptable.

B. The transformer shall meet the most recent standards for efficiency.

C. The unit shall be "UL" approved for indoor/outdoor application.

3.12 TELEMETRY CONTROL INTERFACE PANEL

A. It will be the responsibility of the station manufacturer to provide the following as an adjunct to the supplied telemetry equipment.

1. 1" telemetry entrance conduit complete to telemetry panel.

2. Size 12" x 12" NEMA 1 telemetry interface panel.

3. Separate 120 volt single phase power circuit in conduit to the telemetry interface panel.

4. Telemetry control circuits made up and in conduit from main control panel to telemetry interface panel terminal strip.

5. Metal framing channel to mount telemetry equipment.

3.13 STATOIN PLC SYSTEM

A. System overview

1. The control system shall utilize standard "off the shelf" equipment. Job specific, "one-of-a-kind" customized software and hardware components will not be accepted. A standard system is defined, as one, which has published literature, is available at time of bid, with fully tested hardware and software, such that no development must be done beyond system configuration.

2. The equipment shall be protected from transient voltages and surges induced into the signal lines. The contractor shall provide a permanent earth ground connection to the panel ground lug in order to insure proper operation of transient protectors.

3. A microprocessor-based automatic pump and alarm control system shall be provided for each booster pumping station incorporating an industrial-grade, 16-bit CMOS microcomputer and associated elements suitable for achieving performance as hereinafter described. The controller will incorporate the following:

-Internal diagnostics.
-Real time clock calendar.
-Floating-point math.
-Battery back up.
-Non-proprietary RTU communication.
-(4) PID loops.

4. The system shall incorporate UL 508 Industrial Control Panel approved elements as required of all components of these project panels and be furnished with all necessary hardware and software to accomplish level-responsive pump and alarm operation with software specifically suited to this project.

5. All of the discrete I/O circuitry of the computer-based system shall be built to the IEEE 472 (1974) Surge Withstand Capability Standards. The automatic pump and alarm control system computer shall be the standard product of the control system manufacturer and specifically suited for this type of industrial control panel service. All job connections shall be a UL recognized clamp type barriered screw terminals accepting up to two AWG 14 conductors per terminal.

6. The variable speed drive equipment shall be programmed to respond to variations in the discharge pressure and/or flow in a manner wherein the hydraulic requirement will be accommodated in the pumping program using simple menu-related operator interface routines.

7. Upon power-up, the Controller shall go through a timing routing, which allows the analog signal and display to stabilize before any control, or alarm outputs are enabled. After the stabilization period, the control circuits of the Controller shall be sequentially enabled on a time-step arrangement.

8. In addition to the time delay upon power-up, the differential-level control circuits shall each be forced to an off condition upon power up so that a pressure and/or flow excursion will need to go past their turn-on elevation for them to operate.

9. An alternator shall operate the pumps in a First-on/First-off (FOFO) sequence and can be configured to sequence the pumps every start, every 24 hours, on the lowest run time or manually.

10. The alternator shall be capable of accepting pump failure and/or advance inputs and shall automatically transfer to the next pump sequence when failure condition is sensed.

11. The alternator shall provide automatic transposing of the operating sequence of the control relays for the pumps on successive starts. The FOFO alternator sequencing shall operate such that the next load turned on

is always the one that has had the longest opportunity to rest since its last operation.

12. It is the specific intention of this functional requirement that a standard programmable logic controller will be employed with features as herein described and be a fully integrated assembly. That is, the furnishing of similar functions using a proprietary controller with custom software, a multiplicity of set points, modules or extensive relay-timer logic to accomplish control sequences, etc., is specifically precluded by this specification and will not be acceptable.

13. Microprocessor based, programmable controller and operator interface shall provide all of the above controls and operations.

14. The automatic pump and alarm control shall employ a backlit LCD operator interface having a 320 x 240 pixel eight color display with touch screen. The operator interface shall be IEC standard IP65F rated. The display also must support bar graphs or analog meters for well levels, VFD #1, and #2 speed indications. Operator interface must support screen scrolling and three levels of password protection.

15. A Configuration and Operations Manual will be included for the pump controller. The Manual shall include the following information as a minimum:

    -How to view and change between the various displays.
    -How to configure the controller.
    -How to display alarms.
    -How to display statuses.
    -Analog control set point adjustment.
    -Analog alarm set point adjustment.
    -How to view and reset pump run times.
    -How to view and reset pump start counters.
    -Security Password usage.
    -An example of programming values.
    -Adjustment of the real-time calendar/clock.
    -A listing of values programmed at the factory.
    -A worksheet for entering the values programmed in the field.

The intent of the specification is that a standard controller be provided, with standard documentation. A custom written Description of Operation is not acceptable.

B. Controller Configuration

1. The pump controller operates via a flow meter signal and shall be capable of being configured at the factory or jobsite to perform operating functions as described below. All configurations are password protected and shall be provided as a minimum as follows:

    -Duplex Pump operation.
    -Flow Sensor (4-20mA or Pulse Input).
    -Pressure Transmitter.
    -Level Transducers
    -Clock hours (0-23) and minutes (0-59).
    -Calendar day of week (0-6 for Monday - Sunday).
    -Minimum 1 Pump Speed.
    -Maximum 1 Pump Speed.
    -Discharge transducer rating (5-300 PSI).
    -Level transducer rating

-Alternate service pumps every 24 hours.
-Flow meter rating (5-6999 GPM).
-Sequence pump via set points based on pressure, flow or both.

The pump controller will include the field adjustable delay timers. All timer settings are password protected and shall be provided as follows:

-Pump 1 start fail delay (0-99 seconds).
-Pump 2 start fail delay (0-99 seconds).
-Delay between calls (0.1-9.9 minutes).
-Low well level on delay (0-5 minutes).
-Low well level reset (0-5 minutes).

The pump controller will include the field adjustable set points. Set points are password protected and provided as follows:

-Pump start pressure.
-Pump stop pressure.
-High-pressure alarm set point.
-Low-pressure alarm set point.
-Low well level alarm.
-Low well level alarm reset.

C. Controller Test

1. A password-protected screen will be included to simulate the discharge and suction pressure and the flow rate. For each of these, the Up and Down arrows are used to select automatic increment, automatic decrement, or hold the reading. When the test screen is displayed, the simulate mode is turned on or off by pressing the 'Toggle On/Off' button. If none of the simulate controls are changed by the operator for a period of ten minutes, the simulate mode will be automatically turned off and normal operation will resume.

E. Sequence Selection

1. The controller will allow the operator to select an alternating sequence for the normal service pumps. Depending upon the configuration of the controller, it will allow alternating or fixed sequence of duplex or triplex systems.

F. Alarm Messages

1. In the event of an alarm condition the operator interface will display an alarm message and the auto dialer will call out to alert the operator of the alarm condition. Press the 'Alarm Ack' button to acknowledge the alarm and 'Alarm Reset' button to clear the alarm. The following list of alarms shall be provided:

FLOW AND SUCTION SWITCH OVERLAP message occurs when both a suction pressure switch and no flow switch has been factory configured for the system. Since the devices use the same digital input, one of the devices must be disabled.
SETPOINT OVERLAP CHECK THE SETTINGS message occurs when the controller has detected inconsistencies in the on and off set points between the service pump and third pump configured.
COMMUNICATION FAULT WITH REMOTE STATION message occurs when the remote discharge sensor configuration is enabled and the controller detects a communication problem.
LOW WELL LEVEL ALARM message occurs when the well levels fall below the low well level set point for the

alarm delay period. When this alarm occurs, the pumps will be turned off during the low suction condition This event will also activate the assigned low well level alarm telemetry contact.
HIGH DISCHARGE ALARM FLOW message occurs when the discharge pressure reaches the high discharge pressure alarm set point. At the time of the fault, the flow rate is saved and displayed on the alarm screen. This flow rate will be applicable when the flow control configuration is enabled. The pumps will be disabled, and will resume operation when the discharge pressure falls to the jockey or lead pump start set point (one factory configuration allows a high capacity pump to continue to run in spite of the high discharge condition). This event will also activate the assigned high discharge alarm telemetry contact.
LOW DISCHARGE ALARM message occurs when the discharge pressure falls below the low pressure alarm set point.
PUMP 1 FAULT ALARM message occurs when the assigned pump 1 fault digital input goes active. This event will also activate the assigned normal service pump fail telemetry contact.
PUMP 1 START FAIL ALARM message occurs when the assigned pump 1 run signal does not go active with the activation of the associated pump call relay. This event will also activate the assigned normal service pump fail telemetry contact.
PUMP 2 FAULT ALARM message occurs when the assigned pump 2 fault digital input goes active. This event will also activate the assigned normal service pump fail telemetry contact.
PUMP 2 START FAIL ALARM message occurs when the assigned pump 2 run signal does not go active with the activation of the associated pump call relay. This event will also activate the assigned normal service pump fail telemetry contact.
HIGH CHLORINE ALARM message occurs when the chlorine level reaches the high level set point. At the time of the alarm the station will disable the pumps until the chlorine level has reached an acceptable level. This event will also activate the assigned chlorine alarm.
LOW CHLORINE ALARM message occurs when the chlorine level reaches the low level set point. At the time of the alarm the station will disable the pumps until the chlorine level has reached an acceptable level. This event will also activate the assigned chlorine alarm.

3.14 PUMP MOTOR RUN TIME METER

A. The control panel shall contain one running time meter supplied for each pump to show the cumulative number of hours of operation.

B. The meter shall be enclosed in a dust and moisture proof molded plastic case, suitable for flush mounting on the main control panel.

C. The meter dial shall register in hours and tenths of hours up to 99999.9 hours before repeating.

D. The meter shall be suitable for operation from a 115 volt, 60 cycle supply.

3.15 ELECTRICAL PHASE MONITOR

A. A phase monitor shall be supplied to protect three-phase equipment against phase loss, undervoltage and phase reversal conditions.

B. 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.

C. 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.

3.16 SURGE PROTECTION DEVICE

A. 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.

B. Arresters shall be UL and CSA listed Lightning Protective Devices.

3.17 ELECTRICAL CONDUIT AND WIRING

A. All service entrance conduits power and signal, shall be rigid steel conduit, individually sized to accept the inbound service conductors and telemetry/telephone/radio cables.

B. 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.

C. 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.

D. 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.

E. 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.

F. 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.

G. 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.

H. 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.

I. 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.

3.18 GAUGE PRESSURE TRANSMITTERS

A. Pressure transmitters shall be supplied to measure outlet 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 ±0.20% of span.

B. 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.

C. 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).

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

E. Gauge Pressure Transmitter manufacturer:

1. Foxboro Series IGP10

2. Rosemount 2088G2S22A1M7B4S5.

3.19 ELECTRICAL DEVICES

A. Multi-position switches including Hand-Off-Automatic switches shall be oil tight, 3-position maintained and be located on the main control panel door.

B. Indicating lights shall be oil tight, with a full voltage pilot light.

C. Nameplates shall be furnished on all panel front mounted switches and lights.

D. 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.

E. Switches

1. Pump #1, 3-position;

2. Pump #2(FUTURE), 3-position;

3. Chemical Pump, 3-position;

4. Chemical Pump, 3-position;

5. Exhaust Fan, 2-position;

6. Exhaust Fan, 2-position;

7. Telemetry Test, 2-position.

F. Lights

1. Green – Pump #1 in Operation;

3.20 STATION EXTERIOR LIGHTING

A. An exterior light shall be provided as located on the drawing. The light shall be 50 watt high pressure sodium. Housing shall be one piece, injection molded, bronze polycarbonate. A button type photo control shall be provided.

3.21 STATION INTERIOR LIGHTING

A. There shall be one or more two-tube, 32 watt per tube, electronic start, enclosed and gasketed, forty-eight (48) inch minimum length fluorescent 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.

B. Open fluorescent or incandescent fixtures will not be accepted.

3.22 DEHUMIDIFIERS

A. One (1) each, installed as shown.

B. Capacity 30 pints per 24 hours.

C. Compressor rated 115 volts, 60 Hz, 4.3 operating amps.

D. 106 CFM fan, 2 fan speed.

E. Humidity range 35 to 80% RH, ambient temperature range of 41 to 95 F, Type R410A refrigerant.

F. Washable filter.

G. Condensate piped direct to drain.

H. UL listed rubber cord.

3.23 HEATERS

A. Two (2) each, wall mounted as shown.

B. Rating - 15,000 BTU/HR – propane.

C. Enclosed resistance wire within steel finned element.

D. Control – 120v thermostat.

E. discharge and draw through the wall.

3.24 CONVENIENCE GROUP - SHUTTER-MOUNTED EXHAUST FAN

A. Two (2) each installed as shown.

B. Capacity each 470 CFM of free air at 0.125 inch static pressure.

C. 120 volt, 60 Hz, 1550 rpm, totally enclosed, shaded pole, sleeve bearing motors, Class A insulation.

D. Gray polyester coated steel guard.

E. Cold rolled steel frame with white polyester finish.

F. 12" diameter, stamped aluminum, 3-blade propeller.

G. Hard wired in conduit to conduit box on motor per UL 400-1.

H. UL Listed.

I. 120 volt AC operation from wall mount thermostat and HAND/AUTO switch on main control panel.

J. One (1) 12" x 12" automatic shutter with exterior mounted, aluminum shroud and insect screen.

3.25 CONVENIENCE GROUP - MOTORIZED AIR RETURN SHUTTER

A. One (1) each installed as shown.

B. 12" x 12" 16 gauge extruded aluminum frame.

C. White painted, aluminum blades.

D. 120 volt AC, 60 cycle, single phase electric motor.

E. Operation of shutter from start/stop of exhaust fan described above.

G. One (1) exterior mounted, aluminum shroud and insect screen.

END OF SECTION 444010

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DIVISION 44 –PROCESS EQUIPMENT

SECTION 445000 – GLASS - LINED BOLTED STEEL WATER STORAGE TANK- AWWA D-103 TYPE

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including but not limited to, General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Contractor shall provide all required labor, materials and equipment for furnishing and erecting a Qty one, Model 50 28 Glass-Fused-to-Steel Water Storage Tank(s) constructed of factory prefabricated glass-coated, bolt-together steel panels and a geodesic clear span aluminum dome roof structure. Each tank structure shall include a foundation, floor and other accessory components as shown on the contract drawings and described herein. Note that painted, powder coat, stainless steel or galvanized bolt-together tanks are not acceptable.

B. All required tank materials and principal appurtenances shall be supplied by the tank manufacturer. Tank structures and appurtenances shall be new and not previously used.

C. Tanks shall be designed and produced in the United States of America, by a manufacturer specializing in the production of glass-coated, bolt-together steel tank systems. All structural steel utilized in the tank structure shall be produced and glass coated in the United States of America.

D. The tank manufacturer shall provide documentation upon request, including mill reports and traceable documents to demonstrate the source of steel used in the tank manufacture.

1.3 REFERENCES: Publications by the entities listed below and their latest revisions form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

A. American Society for Testing and Materials (ASTM)

1. ASTM A36/A36M – Standard Specification for Carbon Structural Steel.
2. ASTM A992/A992M – Standard Specification for Structural Steel Shapes.
3. ASTM A1011/A1011M – Standard Specification for Steel, Sheet and Strip, Hot Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
4. ASTM B916 – Standard Test Method for Adherence of Porcelain Enamel Coatings to Sheet Metal.
5. ASTM C633-79 – Standard Test Method for Adhesion or Cohesion Strength of Flame-Sprayed Coatings.

B. American Water Works Association (AWWA)

1. ANSI/AWWA C652 – Standard for Disinfection of Water-Storage Facilities.
2. ANSI/AWWA D100 – Standard for Welded Steel Tanks for Water Storage.
3. ANSI/AWWA D103 – Standard for Factory-Coated Bolted Steel Tanks for Water Storage.

B. American Welding Society AWS D1.2/D1.2M – Structural Welding Code – Aluminum.

C. Federal Specification FS TT-S-00230C – Sealing Compound: Elastomeric Type, Single Component (For Calking, Sealing, and Glazing in Buildings and Other Structures).

D. General Services Administration Commercial Item Description GSA CID A-A-59588A – Rubber, Silicone.

E. National Sanitation Foundation NSF Standard 61 – Drinking Water System Components.

F. Society for Protective Coatings SSPC-SP 10/NACE No. 2 – Surface Preparation Standard - Near White Metal Blast Cleaning.

G. Society of Automotive Engineers (SAE)

H. SAE J429 – Mechanical and Material Requirements for Externally Threaded Fasteners.

I. International Organization for Standardization (ISO):

1. ISO 28706-1:2008 - Vitreous and Porcelain Enamels - Determination of Resistance to Chemical Corrosion.
2. ISO 2859 – Sampling Procedures for Inspection by Attributes
3. ISO 6370-2 – Vitreous and Porcelain Enamels – Determination of Resistance to Abrasion

1.4 QUALITY ASSURANCE

A. ANSI/AWWA D103-09 - Tank steel panel materials, design, fabrication and erection shall conform to all pertinent sections of the AWWA Standard for Bolted Steel Tanks (AWWA D103) and conform to the dimensions of the tank with fully triangulated all aluminum space truss complete with non corrugated closure panels, unless otherwise specified herein.

B. NSF Standard 61 - All material furnished by the tank manufacturer, including vitreous glass-coated steel panels, joint sealant, encapsulated bolt heads, etc., shall be certified and listed by the National Sanitation Foundation (NSF) to meet NSF Additive Standard No. 61. Tank as a system needs to be certified as certification of a coating type alone will not be sufficient to meet this requirement.

C. FACTORY MUTUAL (FM) - Certification of annual review of quality control procedures of the manufacturing plant by FM.

D. IBC Design - Tanks will be designed such that Seismic, Wind and Roof designs conform to the current state and local standards when specified.

E. ISO 9001 - The tank manufacturer’s Quality Assurance program shall be certified to comply with ISO 9001 standards.

1.5 ACCEPTABLE TANK MANUFACTURERS

A. The tank manufacturer shall employ a staff of full time design engineers, and shall own and operate its steel fabrication and glass coating facilities. No other manufacturer will be acceptable for the base bid.

Tank will be supplied by Statewide Aquastore, Inc. located in East Syracuse, New York or equal

B. The Engineer’s selection of factory applied glass-fused-to-steel bolt together tank

construction for this project has been predicated upon specific criteria, construction methods, and an optimum coating resistance to internal and external tank corrosion. Deviations from the specified design, construction or coating details will not be permitted.

C. All bids MUST include a site and project specific foundation design from the tank manufacturer, with a New York State professional engineer stamp. No third party designs will be allowed.

D. The Engineer/owner reserves the right to evaluate all bids based on long term, 30-40 year minimum operation, coating and maintenance costs. Values to be used in this evaluation will be at the discretion of the Engineer to determine which tank best fits the owners needs. The Engineer will add such costs, dependent upon the type of tank offered, to the bidder's price to determine the effective low bid for purposes of making the award.

E. Tank Manufacturer

1. The tank manufacturer shall be a specialist in the design and fabrication with a minimum of 15 years documented experience in the United States in similar climates, sizes and applications.

2. Naming of a manufacturer does not relieve them from complying with the performance features, the salient features and any Made in the USA requirements of the contract documents. The contract documents represent the minimum acceptable standards that will be allowed.

3. In order to assure uniform quality and ease of maintenance, it is the intent of these specifications that all equipment under this section shall be supplied by a single manufacturer and that the equipment manufacturer and installation contractor assume the responsibility for proper installation and functioning of equipment.

4. Manufacturers and/or tank providers lacking the experience requirements will not be considered without prior approval. Strict adherence to the standards of design, fabrication, erection, product quality, and long term performance established in this specification will be required by the engineer and owner.

F. Tank Provider

1. An authorized dealer of the tank manufacturer shall provide and install the tank. Sub contracting of the tank erection by the dealer shall not be permitted. Building crews shall comply with the tank manufacturer's requirements for building practices and equipment used on the job.

2. Employees of the authorized dealer shall be experienced in the construction of the specified tank and should be trained in a factory training program ensuring builder certification by the tank manufacturer, and shall be employed full time by the authorized dealer.

3. The tank provider/builder shall have built, on its own, in North America, at least 20 installations of similar type that are equal or greater in size than the specified tank, operating satisfactorily for a minimum of (15) fifteen years. Tanks shall be designed to AWWA D103 standards. Tank manufacturer and tank provider shall each provide with bid the reference name, address and telephone number of the responsible representative , application and year of supply/operation of liquid tanks installed in the United States. List should indicate the specific application.

4. Builders lacking the experience requirement will not be considered unless they provide a satisfactory 5 year 100% performance bond in lieu of evidence of experience and long term

operation.

G. Substitute/Alternate/Or Equal Bids

1. Substitute/Alternate/Or Equal bids will only be considered with prior approval by the engineer. This requirement is intended to protect the owner so that no one bidder gains an unfair price advantage by quoting a lesser product that does not fully comply with the minimum performance and salient features set forth in these specifications.

2. All requests must be made at least 5 days prior to the specified bid date or they will not be considered. Only bids from tank providers/builders who have successfully prequalified will be considered. The engineers decision or judgment on these matters will be final, conclusive and binding.

3. If the bidder fails to pre-qualify and provide the documentation deemed necessary by the engineer to evaluate a proposed substitute/alternate/or equal equipment, the proposed tank will be rejected. The engineer is the sole authority for determining conformance to the specifications and whether to pre-quality a proposed supplier. Under no circumstances will they be required to prove that an alternate product is not equal to the specified equipment

1. Provide NY State PE stamped tank general arrangement drawings with full dimensions and a list of all appurtenances proposed. Include a tabulation of the number of steel sheets in each tank ring, and the number of rings, the sheet thickness, the steel grade, and the maximum allowable tensile stress for each ring. Provide a copy of this specification with a check mark next to each item where the proposed equipment does not adhere to the specification, provide information on the exception and how the proposed equipment would be brought into adherence with the item required.

1.6 SUBMITTALS

A. Before executing any work in this Section, the tank manufacturer shall submit for Documentation job specific PE stamped tank foundations, general arrangement drawings and specifications for the tank structures and all appurtenances.

B. Structural calculations shall be submitted for tank structures, dome structures and foundations. The calculations shall be reviewed and the submittals sealed by a Professional Engineer licensed and registered in NYS.

C. Submittals shall include certification that each applicable Section of AWWA D103 is met. Any exceptions taken shall be noted with full explanation given for the deviation. Copy of Builder Certification Program, sponsored by the tank manufacturer, certifying factory training and experience of the proposed Builder.

D. The tank manufacturer shall provide a standard Operation and Maintenance Manual upon approval of the drawings and completion of the tank installation.

E. Due to the long lead time for the tank, the shop drawings shall be submitted within 15 days of the Notice of Award issued by the Village.

F. A submittal review deposit in the amount of $2,000, payable to the owner, shall be submitted with the request for review of any deviations from the plans and specifications. The deposit will be used by the engineer at a rate of $150/hour to review such requests, regardless of whether the substitution is approved or rejected. The owner will return any unused funds to the petitioner within 30 days of acceptance of submittals. All engineering costs which cause changes in design from the plans and specifications are to be borne entirely and unconditionally by the contractor.

1.7 WARRANTY

A. If within a period of one (1) year from date of completion (or 14 months after delivery), the tank structure or any part thereof shall prove to be defective in material or workmanship upon examination by the manufacturer, the manufacturer will supply a replacement part, will repair, or allow a credit for same.

The warranty shall be further extended with the use of a Manufacturer supplied Cathodic Protection system as follows: the glass coated product zone surfaces, that portion of the tank interior below the normal high elevation of the contained liquid will not corrode under normal and proper use, maintenance and operation during the period expiring on the earlier of (i) 60 months after liquid is first introduced into the tank or (ii) 62 months after shipment from the factory.

PART 2 - PRODUCTS

2.1 GENERAL

A. Tank structures shall be of vertical, cylindrical, flat bottom glass-coated, bolt-together steel construction. Epoxy, powder coated, galvanized or stainless steel are not considered equal and not be considered.

2.2 TANK SIZE

A. Tank shall be in 100% adherence to US, State and local codes, standards and requirements. No foreign designs or deviations will be accepted.

B. The factory coated glass-fused-to-steel; bolt together tank shall have a nominal diameter of 50.35 feet, with a nominal sidewall height (to roof eave) of 28.43 feet.

C. Tank capacity shall be 423,400 gallons (nominal, U.S. gallons) and 408,500 gallons (useable) at 27.43 feet liquid depth, including 12 inches of freeboard.

2.3 DESIGN LOADS

A. Specific Gravity 1.0

B. Design Freeboard 12 inches.

C. Net allowable soil bearing capacity 4000 PSF

D. Earthquake Seismic Data
1. Design per *IBC 2009*
2. Map Spectral Response
i. S_s .154
ii. S_1 .048
1. Seismic Use Group III
4. Site Class C

E. Ground Snow Load
1. Ground Snow Load 40 PSF.
2. Importance Factor 1.0 (I_s)
3. Thermal Factor 1.0 (C_t)
4. Exposure Factor 1.0 (C_e)

F. Wind Load
   1. Wind Speed 100 mph
   2. Importance Factor 1.15 (I_W)
   3. Exposure Category C

G. Tank Wall color (Outside) CoBalt Blue

H. Tank Wall color (Inside) Cream Color

2.4 PLATES AND SHEETS

A. Plates and sheets used in the construction of the tank shell, floor, or roof shall comply with the minimum standards of AWWA D103, latest edition. All steel shall be smelted and produced in the United States of America.

B. The annealing effect created from the glass coated firing process shall be considered in determining ultimate steel strength. In no event shall a yield strength greater than 50,000 psi be utilized for calculations detailed in AWWA D103, latest revision.

C. Design requirements for mild strength steel shall be ASTM A-1011 Grade 30 with a maximum allowable tensile stress of 14,566 psi. High strength steel shall be ASTM A-1011 Grade 50 with a maximum allowable tensile stress of 26,000 psi.

D. When multiple vertical bolt line sheets and plates of ASTM A-1011 Grade 50 are used, the effective net section area shall not be taken as greater than 85% of the gross area.

E. When Rolled Structural Shapes are used, the material shall conform to minimum standards of ASTM A36 or ASTM A992.

F. Minimum acceptable sheet thicknesses:

1.	Fdn	.197
2.	Course 6	.197
3.	Course 5	.164
4.	Course 4	.132
5.	Course 3	.099
6.	Course 2	.099
7.	Course 1	.099

G. Chemical compositions for mild steel and high strength steel shall be stated in the submitted mill certifications. Raw steel for plates and sheets shall conform to the following composition requirements. These specifications refer to the design tensile strength after firing.

The steel shall have the following chemical composition

1.	Carbon (Mild)	0.06% maximum
2.	Carbon (HSS)	0.10% maximum
3.	Manganese	1.50% maximum
4.	Phosphorus	0.04% maximum
5.	Sulfur	0.05% maximum
6.	Aluminum	0.08% maximum

2.5 HORIZONTAL WIND STIFFENERS

A. Stiffeners shall be of the "web truss" design, with extended tail to create multiple layers

of stiffener, fabricated of steel with hot dipped galvanized coating. Rolled angle stiffeners shall not be permitted for intermediate horizontal wind stiffeners.

B. Maximum web stiffeners allowed is three at bottom of courses 1, 2 and 3.

2.6 BOLT FASTENERS

A. Bolts used in tank lap joints shall be 1/2-13 UNC-2A rolled thread and shall meet the minimum requirements of AWWA D103, latest revision.

1. Bolt material shall be SAE J429 Grade 2 (1" bolt length) with a tensile strength of 74,000-psi minimum, and a proof load of 55,000-psi min. and an allowable shear stress with threads excluded from the shear plane of 18,163-psi min.

2. SAE J429 Grade 5/ASTM A325 (1-1/4" bolt length) and heat treated to a tensile strength of 120,000 psi min and a proof load of 85,000 psi min. and having an allowable shear stress with threads excluded from the shear plane of 29,454 psi min.

3. SAE J429 Grade 8/ASTM A490 (bolts greater than 1-1/4") and heat treated to a tensile strength of 150,000 psi min and a proof load of 120,000 psi min. and having an allowable shear stress with threads excluded from the shear plane of 36,818 psi min.

B. The bolt finish shall be Zinc, mechanically deposited.

C. The entire bolt head shall be encapsulated up to the splines on the shank with high impact polypropylene copolymer. Resin shall be stabilized with an ultraviolet light resistant material such that the color shall appear black. The bolt head encapsulation shall be certified to meet the ANSI/NSF Standard 61 for indirect additives.

D. All lap joint bolts shall be properly selected such that threaded portions will not be exposed in the "shear plane" between the sheets. In addition, bolt lengths shall be sized as to achieve a neat and uniform appearance. Excessive threads extending beyond the nut will not be permitted.

E. All lap joint bolts shall include a minimum of four (4) splines, on the underside of the bolt head at the shank in order to resist rotation during torque wrench application.

2.7 SEALANTS

A. The lap joint sealant shall be a one component, moisture cured, polyurethane compound. The sealant shall meet applicable FDA Title 21 regulations, and be manufactured by a United States supplier as well as be suitable for contact with potable water and shall be certified to meet ANSI/NSF Additives Standard No. 61. The sealant shall be used to seal lap joints, bolt connections and sheet edges. The sealant shall be CST Storage, Manus Sealer No. 98. The sealant should have a curing rate at 73°F and 50% RH and be tack free in 6 to 8 hours. Final cure time should be 10 to 12 days. Sealer shall be resistant up to 200-ppm chlorine concentration during disinfection. Neoprene gaskets and tape type sealer shall not be used.

B. The sealant shall cure to a rubber like consistency, have excellent adhesion to the glass coating, low shrinkage and be suitable for interior and exterior use.

C. Due to poor compatibility with chlorine, the sealant Sika 1A shall not be used on potable water storage tanks.

2.8 GLASS COATING PROCESS

A. GENERAL - The glass coating system shall be in full accordance with the requirements of AWWA D103, latest revision. Every batch of coating frits shall be individually tested in accordance with PE1 Test T-21. (Citric acid at room temperature)

B. SURFACE PREPARATION - Following the de-coiling and shearing process, sheets shall be steel grit blasted on both sides to the equivalent of SSPC PC-10 (near white metal blast cleaning). Sandblasting and chemical pickling of steel sheets is not acceptable. The surface anchor pattern shall be not less than 1.0 mils. (.0001 inches). Sheets shall be evenly oiled on both sides to protect them from corrosion during fabrication.

C. CLEANING - After fabrication and prior to application of the coating system, all sheets shall be thoroughly cleaned by caustic wash and hot water rinse followed immediately by hot air drying. Inspection of the sheets shall be made for traces of foreign matter, soil particles, grease or rust. Any such sheets shall be re-cleaned or grit-blasted to an acceptable level of quality.

D. COATING APPLICATION

1. All sidewall sheets shall receive one coat of a catalytic
2. nickel oxide glass pre-coat to both sides, followed by air-drying.
3. A second coat of milled cobalt blue glass shall be made to both sides of the sheets and Then dried.
4. A third cover coat of milled titanium dioxide white glass shall then be applied to the
5. inside of the sheet and the sheet edges. This milled glass shall be formulated with titanium dioxide to produce a finish interior surface with optimum toughness and resistance to conditions normally found in potable water storage tanks. This specific coating shall be Aquastore Vitrium. Any alternate three coat system must be submitted for approval and acceptance prior to bid.
6. The sheets shall then be fired at a minimum temperature of 1500 °F in strict accordance
7. with ISO 9001 quality process control procedures, including firing time, furnace humidity, temperature control, etc.
8. The dry film interior coating thickness shall be 10-18 mils min. The dry film exterior
9. coating thickness shall be 7-15 mils min.
10. This is a three coating process. The finished tank inside sidewall glass coating shall be
11. white.
12. The standard tank sidewall finished outside color shall be Cobalt Blue. (Munsell standard
13. 7.5 PB 2/4.)
14. Finished outside colors shall not vary noticeably among tank panels. Off color panels will
15. be rejected; replacement panels of matching color shall be supplied by the tank manufacturer.

E. SHEET EDGE COATING - After initial sheet preparation, all four (4) exposed continuous edges of full height vertical wall sheets and all rectangular shaped floor sheets shall be mechanically beveled and coated with a 316 stainless steel corrosion resistant alloy shall be thermally bonded on these edges at a thickness of 1.5 to 5 mils prior to the glass coating of the sheet edges. Hand grinding of the sheet edges is not allowed. All exposed sheet edges will then be coated the same as the glass coating of the sheets. The process shall be equal to the Edge Coat™ by CST Storage. Sealer or glass overspray as edge coating shall not be acceptable. The coating shall have a tensile strength of 1500 psi.

F. INSPECTION

1. All coated sheets shall be inspected for mil thickness using an electronic dry film thickness gage with a valid calibration record. Test frequency shall be every tenth sheet and shall measure thicknesses of glass between 10 – 18 mils.
2. All sheets shall be measured for color using an electronic colorimeter with a valid

calibration record. Test frequency shall be every tenth sheet and the color must fall within the specified tolerance or it shall be rejected.

3. An electrical leak detection test shall be performed on the inside surface of each panel after fabrication. Inside wet sheet surfaces shall be inspected using a low voltage wet sponge holiday tester in accordance with ASTM D5162-91 The tester shall be used at a voltage of 67.5 volts (+/- 10 %) and set so the alarm is sounded if the electrical resistance of the glass coating falls below 125,000. The tester shall have a valid calibration record. The testing solution used to wet the sponge shall contain a low suds wetting agent added at a ratio of not more than ½ fluid oz. per gallon of water. Every sheet shall be 100% tested for holidays and any sheet with a discontinuity shall be rejected. Additionally the inside sheets shall be inspected using a 1000 volt dry test in accordance with Method B of ASTM D5162.01.
4. All inside sheet surfaces shall be holiday free. A dry volt test using a minimum of 1100 volts may be used. Frequency of the test shall be every sheet. Any sheet registering a discontinuity on the interior surface shall be rejected
5. Adherence of the glass coating to the tank steel shall be tested in accordance with ISO standards. Any sheet that has poor adherence will be rejected. The minimum frequency of testing for this shall be one sheet per gage lot run.
6. Glass coating shall be tested for fishscale by placing the full size production sheets in an oven 400°F for one hour. The sheets will then be examined for signs of fishscale. Any sheet exhibiting fishscale shall be rejected and all sheets from that gage lot will be similarly tested. The minimum frequency of testing for this shall be one sheet per gage lot run.

2.9 FLOORS

1. The tank floor shall be constructed either of reinforced concrete as shown on contract drawings. If fill is used, the fill under the floor/footing shall be compacted and tested to a minimum of 95% of proctor.
2. Reinforced concrete floors shall be constructed as shown and specified elsewhere in the contract documents. The floor design shall include an embedded glass-coated starter sheet ring with a minimum of 8” embedment depth per the manufacturers design and in accordance with AWWA D103, as designed. Slot mount foundations are not acceptable.
3. Concrete floors may be poured monolithically for tank diameters up to and including 101 feet. For larger structures, floors shall be quadrant poured. Concentric ring pouring shall not be allowed due to water-stop installation problems.

2.10 ROOFS

A. Tank roof shall be furnished by the tank manufacturer and be constructed of triangular aluminum panels as shown on contract drawings.

B. Roofs shall be clear span and self-supporting. Center post supports are not permitted. Roof live loads and dead loads shall be carried by tank sidewalls, without additional support. A roof hatch, with a hinged gasketed cover and locking hasp, shall be provided near the outside tank ladder.

C. Roofs shall be manufactured and supplied from the same manufacturer as the tank.

1. Aluminum dome roofs are aluminum in color and shall be constructed of non-corrugated, triangular aluminum panels, which are sealed and firmly clamped in an interlocking manner within a fully triangulated aluminum space truss system of wide flange extrusions, thus forming a dome structure. They shall be supplied by CST Storage, the tank manufacturer. Fabric type flashing is not allowed.

2. The dome shall be self supporting from the periphery structure with horizontal thrust contained by an integral tension ring.

3. The walkway and handrail if supplied shall be constructed of aluminum.

4. The roof manway opening shall be at least 30" square. The opening shall have a curb of at least 4" in height, and the cover shall have a downward overlap of at least 2". The manway shall be aluminum.

5. Dome Materials:

    a. Triangulated dome frame struts: 6061-T6 aluminum.
    b. Structural frame gussets: 6061-T6 aluminum, 0.375 inch nominal thickness.
    c. Triangular closure panels: .050 inch nominal thickness, 3003-H16 aluminum Sheet.
    d. Triangular skylight panels, (if specified): ¼ inch thick clear acrylic. Skylight square footage shall be
    e. 1% of covered area, minimum.
    f. Perimeter tension/compression ring: 6061-T6 aluminum.
    g. Fasteners: 7075-T73 anodized aluminum or Series 300 stainless steel.
    h. Sealant: Silicone by Pecora, General Electric Silpruf or equal.
    i. Gaskets: Silicone, General Electric SE-44/88 or equal.
    j. Anchor Fasteners: Series 300 stainless steel.
    k. Dormers, doors, and hatches: 6061-T6, 5086-H34 or 5052-H36 aluminum, 0.090inch nominal thickness.

2.11 APPURTENANCES

A. ROOF VENT

1. A properly sized aluminum vent assembly in accordance with AWWA D103 shall be furnished and installed above the maximum water level. At maximum possible rate of water fill or withdrawal, the resulting interior pressure or vacuum will not exceed 0.5-inch water column. Protection against birds and protection against ice plugging shall be provided. An insect screen shall be provided and designed to open should the screen become plugged by ice formation.
2. The vent shall be constructed of aluminum such that the hood can be unbolted and used as a secondary roof access.

B. PIPE CONNECTIONS

1. Where pipe connections are shown to pass through tank panels, they shall be field located, saw cut, (acetylene torch cutting or welding is not permitted), and utilize an interior and exterior flange assembly. Tank shell reinforcing shall comply with AWWA D103 latest edition. CST Storage Sealer No. 98 shall be applied on any cut panel edges or bolt connections.

C. OUTSIDE TANK LADDER

1. An outside tank ladder shall be furnished and installed as shown on the contract drawings. Ladders shall be aluminum and utilize grooved, skid-resistant rungs. Ladder must comply with OSHA 29 CFR 1910/1926.
2. Safety cage and step-off platforms shall be fabricated of galvanized steel. Ladders shall be equipped with a hinged lockable entry device.

D. ACCESS DOORS

1. Each tank shall be provided with one (1) 24-inch diameter bottom access door as shown on contract drawings per AWWA D103. The manhole opening shall be a minimum of 24 inches in diameter. The access door and tank shell reinforcing shall comply with AWWA D103 latest

edition. A davit to hold the cover plate is required. The access door shall be 24-36 inches above grade and free from ice shear.

E. IDENTIFICATION PLATE

1. A manufacturers nameplate shall list the tank serial number, tank diameter and height, maximum design capacity, intended storage use, and date of installation. The nameplate shall be affixed to the tank exterior sidewall at a location approximately 5' from grade elevation in a position of unobstructed view.

F. TANK OVERFLOW

1. Tank overflow shall consist of irrigation grade aluminum piping that is securely attached to the outside of the tank and shall discharge to a pad within 1’ above finished grade. Provide stainless steel insect screen.
2. Provide a contoured 3’ wide concrete splash pad 4” thick, to direct water to the drainage swale.

G. CATHODIC PROTECTION SYSTEM

1. The tank manufacturer will provide a cathodic protection system designed specifically for the project tank, consisting of sacrificial anodes which provide protection for the portion of the structure immersed in liquid. The anodes are attached to the floor, and bolted through existing shell sheet bolt holes. Lead wires and buss bars are used to ensure continuity between anodes and all structure shell sheets.

2. The cathodic protection system shall be designed by a licensed professional engineer employed by the tank manufacturer. The system shall be designed to protect both the tank and the foundation rebar in concrete floors. The cathodic protection system must meet ANSI/NSFR 61 standards.

2.12 PACKAGING

A. All sheets that pass Factory Inspection and Quality Control checks shall be protected from damage prior to packing for shipment.

B. Heavy paper or plastic foam sheets shall be placed between each panel to eliminate sheet-to-sheet abrasion during shipment.

C. Individual stacks of panels will be wrapped in heavy mil black plastic and steel banded to special wood pallets built to the roll-radius of the tank panels. Shipment from the factory shall be by truck, exclusively hauling the tank components. This procedure minimizes contact or movement of finished panels during shipment.

PART 3 EXECUTION

3.1 ERECTION

A. GENERAL: Supervisory personnel of the erection crew shall identify themselves to responsible personnel of the Engineer or Inspector upon initially entering the job site. Only trained and certified personnel will be allowed on site.

B. TANK FOUNDATION

1. The tank foundation shall be built in accordance with the contract drawings and/or approved Shop Drawings and shall be designed by the manufacturer to safely sustain the structure

and its live loads. Only embedded starter ring designs are acceptable. Slot mount foundations will not be allowed.

2. Leveling of the starter ring shall be required and the maximum differential elevation with the ring shall not exceed 1/8 inch, nor exceed 1/16 inch within any 10 feet of circumference.
3. In no case shall the backfill elevation vary more than one (1) foot around the periphery of the tank shell.
4. A leveling plate assembly, consisting of two anchor rods and a slotted plate shall be used to secure the starter ring, prior to encasement in concrete. Installation of the starter ring on concrete blocks or bricks, using shims for adjustment, is not permitted.
5. Place one butyl rubber elastomeric waterstop seal on the inside surface of the starter ring below the concrete floor line. Place one bentonite impregnated water seal below the butyl rubber seal. Install materials in accordance with CST Storage instructions.
6. Tank footing design shall be based on the soil bearing capacity given by the engineer, as determined by geotechnical analysis performed by a licensed soils engineer. Copies of the soil report will be provided to the bidder prior to bid date by the Owner or Engineer.

C. TANK STRUCTURE

1. Field erection of the glass-coated, bolted-steel structures and components shall be in strict accordance with the procedures established by manufacturer and performed by the authorized dealer who is providing the tank of the tank manufacturer regularly engaged in erection of these tanks, using factory-trained certified erectors fully employed by the Dealer.
2. Vertical tank seams shall be offset. Straight seam 4 corner joints are not acceptable.
3. Only specialized erection jacks and building equipment developed and supplied by the tank manufacturer shall be used to erect the tanks.
4. Particular care shall be taken in handling and bolting of the glass-coated steel tank panels, appurtenances and members to avoid abrasion of the coating system. Prior to liquid test, all surface areas shall be visually inspected. Chips or scrapes in the glass coating shall be repaired per the tank manufacturer's recommended procedure.
5. An electrical leak test shall be performed during erection using a wet sponge nine-volt leak detection device. All electrical leak points found on the inside surface shall be repaired in accordance with manufacturers published touch-up procedures.
6. No backfill is to be placed against the tank sidewall without prior written approval of the tank manufacturer. Any backfill allowed shall be placed strictly in accordance with the instructions of the tank manufacturer.

D. GEODESIC DOME STRUCTURE

1. The roof supplier shall perform all manufacturing work described herein with mechanics skilled and experienced in the fabrication of aluminum dome roof structures. Fabrication shall be done in an ISO 9001 certified facility.
2. All field work shall be completed by the roof suppliers qualified erection crew. Sub-contracting of the roof erection is not allowed.
3. Field re-fabrication of structural components or panels will not be accepted. Forcing of the structure to achieve fit-up during construction is expressly forbidden and not acceptable. Any indication of improper fit-up of parts shall be immediately reported to the fabricator.
4. All sealant joints shall be tooled slightly concave after sealant is installed. Care shall be taken to keep sealant confined to the joint in a neat manner. Any sealant applied outside of the joint shall be removed so that the panels will be free from misplaced sealant. All gasket materials shall be continuous, splices will not be allowed.

3.2 FIELD TESTING

A. Following completion of erection and cleaning of the tank, the structure shall be tested for liquid tightness by filling to its overflow elevation.

B. Any leaks disclosed by this test shall be corrected by the authorized dealer in accordance with the manufacturer's recommendations.

C. Water required for testing will be furnished and disposed of by the Owner following completion of tank erection. Labor and equipment necessary for hydrostatic tank testing shall be included in the contract price of the tank.

3.3 DISINFECTION

A. Conduct inspection of tank interior before beginning disinfection:

1. Verify tank is clean and free of polluting materials.
2. Very tank pipe and vent connections are properly made and clear of obstructions.
3. Verify coatings and sealants are thoroughly cured in accordance with the manufacturers instructions.

B. The tank structure shall be disinfected at the time of testing by chlorination in accordance with AWWA C652-02, or latest revision, "Disinfection of Water Storage Facilities".

C. Acceptable method of disinfection: Chlorination Method 1, 2 or 3 per AWWA C652-02.

D. Acceptable form of chlorine for disinfection: Sodium Hypochlorite, as specified in AWWA C652-02.

E. Disinfection shall not take place until the tank sealant is fully cured (10 to 12 days at 73°F and 50% relative humidity or equivalent).

3.4 INSPECTION

A. On or near the (1) year anniversary date of initial tank use (but not more than (14) months from date of delivery of tank materials to job site), the manufacturer's authorized dealer shall make a visual inspection of the tank interior coating and appurtenances, tank exterior coating and appurtenances, and the immediate area surrounding the tank for evidence of leakage. A written summary of the inspection report will be filed with the tank owner and the tank manufacturer.

B. Water required for the inspection process will be furnished and disposed of by the Owner.

END OF SECTION

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STRUCTURAL NOTES:

1. GENERAL

1.1. PROJECT LOCATION

A. LOCATION..... BENNETT STREET
CANASERAGE, NEWYORK

B. MUNICIPALITY..... VILLAGE OF CANASERAGA, ALLEGANY COUNTY, NEW YORK

1.2. BUILDING CODES AND STANDARDS

A. BUILDING CODE OF NEW YORK STATE (BCNYS) 2010.

B. EXIST BUILDING CODE OF NEW YORK (EBCNYS) 2010.

C. AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE) – MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES, 2005 EDITION (ASCE 7)

1.3 OCCUPANCY

A. CLASSIFICATION..... GROUP U
B. CATEGORY..... II

1.4 DESIGN LOADS

A. DEAD LOADS
1. ROOF..... 15 PSF

B. LIVE LOADS
1. ROOF (MINIMUM)..... 20 PSF
2. FLOOR ON GRADE..... 100 PSF

C. SNOW LOADS
1. GROUND SNOW LOAD (Pg)..... 46 PSF
2. SNOW LOAD IMPORTANCE FACTOR (Is)..... 1.0
3. TEMPERATURE FACTOR (Ct)..... 1.2
4. EXPOSURE FACTOR(Ce)..... 1.0
5. FLAT ROOF SNOW LOAD (Pf)..... 38.6 PSF
6. UNIFORM ROOF AND BALANCED LOAD (Ps)..... 36.2 PSF

D. WIND LOADS
1. BASIC WIND SPEED (V), 3 SECOND GUST..... 90 MPH
2. WIND IMPORTANCE FACTOR..... 1.0
3. WIND EXPOSURE..... C
4. INTERNAL PRESSURE COEFFICIENT..... ±0.18
5. COMPONENT & CLADDING DESIGN WIND PRESSURE
a. ROOF PRESSURE (50 SF)..... -22 PSF, +10 PSF
b. WALL PRESSURE (50 SF)..... -21.3 PSF, +16.9 PSF

E. EARTHQUAKE DESIGN DATA
1. SEISMIC OCCUPANCY CATEGORY..... I
2. SEISMIC IMPORTANCE FACTOR (Ie)..... 1.0
3. Ss..... 15.5%g
4. S1..... 4.8%g
5. SITE CLASS..... D
6. SPECTRAL RESPONSE COEFFICIENTS
a. Sds..... 0.165
b. Sd1..... 0.077
7. SEISMIC DESIGN CATEGORY..... B
8. BASIC SEISMIC-FORCE RESISTING SYSTEM...
STRUCTURAL STEEL SYSTEMS NOT SPECIFICALLY DETAILS FOR SEISMIC RESISTANCE
9. SEISMIC RESPONSE COEFFICIENT (Cs)..... 0.055
10. RESPONSE MODIFICATION FACTOR (R)..... 5.3
11. DESIGN BASE SHEAR..... 0.06W
12. ANALYSIS PROCEDURE..... EQUIVALENT LATERAL FORCE

F. LATERAL EARTH PRESSURE
1. AT REST EARTH PRESSURE..... N/A
2. ACTIVE EARTH PRESSURE..... N/A

G. FLOOD LOADS..... N/A

1.5 GENERAL REQUIREMENTS

A. VERIFY EXISTING CONDITIONS AND DIMENSIONS PRIOR TO BEGINNING WORK OR FABRICATING MATERIALS. NOTIFY STRUCTURAL ENGINEER OF RECORD (SER) OF ANY DISCREPANCIES BEFORE PROCEEDING WITH ANY PHASE OF WORK.

B. VERIFY THE LOCATION OF CHASES, INSERTS, OPENINGS, SLEEVES, AND DEPRESSIONS,

C. DO NOT SCALE DRAWINGS FOR THE PURPOSE OF ESTABLISHING DIMENSIONS.

D. DETAILS LABELED "TYPICAL DETAILS" ON DRAWINGS APPLY TO SITUATIONS OCCURRING ON THE PROJECT THAT ARE THE SAME OR SIMILAR TO THOSE SPECIFICALLY DETAILED. SUCH DETAILS APPLY WHETHER OR NOT DETAILS ARE REFERENCED AT EACH LOCATION. NOTIFY SER OF CONFLICT REGARDING APPLICABILITY OF "TYPICAL DETAILS".

E. DO NOT LOAD THE SLAB ON GRADE OR SUPPORTED SLAB WITH ERECTION CRANES OR ERECTION EQUIPMENT. THE SLABS HAVE NOT BEEN DESIGNED FOR CRANE LOADS AND WILL REQUIRE AN INCREASE IN THICKNESS AND/OR REINFORCEMENT. OBTAIN SER APPROVAL ON PROPOSED CRANE SUPPORT PLAN FOR SLABS PRIOR TO COMMENCING WORK.

F. BEFORE PROCEEDING WITH ANY WORK WITHIN THE PROJECT AREA, THE CONTRACTOR SHALL FAMILIARIZE HIMSELF WITH EXISTING STRUCTURE AND OTHER CONDITIONS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PROVIDE ALL NECESSARY BRACINGS, SHORINGS AND OTHER SAFE GUARDS TO MAINTAIN ALL PARTS OF EXISTING STRUCTURES AND FACILITIES IN A SAFE CONDITION DURING THE PROCESS OF DEMOLITION AND CONSTRUCTION AND TO PROTECT FROM DAMAGE THOSE PORTIONS OF EXISTING STRUCTURES AND FACILITIES WHICH ARE TO REMAIN.

H. THE CONTRACT STRUCTURAL DOCUMENTS REPRESENT THE FINISHED STRUCTURE. THE CONTRACTOR IS RESPONSIBLE FOR THE MEANS AND METHODS OF CONSTRUCTION. COMPLY WITH APPLICABLE REQUIREMENTS OF OSHA AND OTHER GOVERNING BODIES HAVING JURISDICTION AT THE SITE.

1. GENERAL (CONTINUED)

1.6 SPECIAL INSPECTIONS

A. SPECIAL INSPECTIONS SHALL BE PROVIDED IN ACCORDANCE WITH THE GOVERNING BUILDING CODE AND THE STATEMENT OF REQUIRED SPECIAL INSPECTIONS PREPARED BY THE DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE.

B. WHERE SPECIAL INSPECTION REQUIREMENTS DUPLICATE THE REQUIREMENTS OF OTHER SPECIFIED TESTING, DUPLICATE INSPECTIONS SHALL NOT BE REQUIRED

2. EARTHWORK AND FOUNDATIONS

2.1 EARTHWORK AND FOUNDATION DESIGN IS BASED UPON THE GEOTECHNICAL REPORT ENTITLED, "GEOTECHNICAL EVALUATION REPORT FOR PROPOSED WATER TREATMENT BUILDING AND NEW WATER STORAGE TANK, VILLAGE OF CANASERAGA, CANASERAGA, ALLEGANY COUNTY, NEW YORK" PERFORMED BY EMPIRE GEO-SERVICES, INC., PROJECT NO. BE-13-069, DATED MAY, 2013.

2.2 THE CONTRACTOR SHALL PROVIDE AND OPERATE DEWATERING EQUIPMENT AND BE RESPONSIBLE FOR MAINTAINING EXCAVATIONS AND WORK AREAS IN A DRY CONDITION. WATER SHALL BE DISCHARGED TO A LOCATION SUITABLE TO THE SER AND IN ACCORDANCE WITH APPLICABLE LOCAL, STATE AND FEDERAL LAWS AND REGULATIONS.

2.3 ARRANGE FOR OWNER'S INDEPENDENT TESTING AGENCY TO MONITOR CUT AND FILL OPERATIONS AND PERFORM FIELD DENSITY AND MOISTURE CONTENT TESTS TO VERIFY COMPACTION AND APPROVE FOOTING SUBGRADES PRIOR TO PLACING CONCRETE.

2.4 BACKFILL

A. ALL BACKFILL AND TRENCHING OPERATIONS SHALL COMPLY WITH ALL CURRENT AND APPLICABLE LOCAL, STATE AND FEDERAL SAFETY CODES, INCLUDING THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION.

B. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING ADEQUATE SHORING OF THE NEW AND EXISTING CONSTRUCTION DURING CONSTRUCTION OPERATIONS IN ORDER TO PREVENT ANY DAMAGE DUE TO BACKFILLING AND TRENCHING.

2.5 STRUCTURAL FILL

A. STANDARDS

1. NEW YORK STATE DEPARTMENT OF TRANSPORTATION, STANDARD SPECIFICATIONS, ITEM 304.14-TYPE 4

B. EXECUTION

1. AFTER ACHIEVING FINISHED SUBGRADE IN CUT AREAS AND PRIOR TO PLACING STRUCTURAL FILL IN AREAS BELOW FINISHED SUBGRADE, THE EXPOSED SUBGRADE SHALL BE EVALUATED BY THE GEOTECHNICAL ENGINEER OF RECORD TO CONFIRM THAT ALL UNSUITABLE OR UNSTABLE MATERIALS HAVE BEEN REMOVED.
2. UNLESS NOTED OTHERWISE IN THE GEOTECHNICAL REPORT, ALL STRUCTURAL FILL SHALL BE PLACED IN HORIZONTAL LIFTS NOT EXCEEDING EIGHT (8) INCHES IN LOOSE THICKNESS AND WITHIN TWO (2) PERCENT OF OPTIMUM MOISTURE FOR COMPACTION. THE STRUCTURAL FILL SHALL BE COMPACTED TO 95 PERCENT OF MAXIMUM DRY DENSITY AS DETERMINED BY MODIFIED PROCTOR (ASTM D1557).
3. MAINTAIN SUBGRADE AND STRUCTURAL FILL MOISTURE CONTENT UNTIL FOUNDATIONS ARE PLACED.

2.6 GRANULAR BASE MATERIAL

A. A MINIMUM OF SIX (6) INCHES OF GRANULAR BASE MATERIAL SHALL BE PLACED UNDER ALL CONCRETE SLABS-ON-GRADE.

B. MATERIAL

1. MEETING EH REQUIREMENTS OF NEW YORK STATE DEPARTMENT OF TRANSPORTATION, STANDARD SPECIFICATION ITEM 203.07- SELECT GRANULAR FILL OR ITEM 203.20 – SELECT GRANULAR SUBGRADE

2.7 FOUNDATIONS

A. ALL BEARING AREAS FOR FOUNDATIONS SHALL BE INSPECTED AND APPROVED BY THE GEOTECHNICAL ENGINEER OF RECORD PRIOR TO ANY PLACEMENT OF CONCRETE. IF BEARING AREAS ARE NOT SUITABLE, AS DETERMINED BY THE GEOTECHNICAL ENGINEER, THE CONTRACTOR MAY BE REQUESTED TO CARRY THE EXCAVATION DEEPER TO MORE SUITABLE BEARING MATERIAL.

B. COORDINATE STRUCTURAL PLANS AND DETAILS WITH REQUIREMENTS OF THE GEOTECHNICAL REPORT.

C. FOOTING DESIGN IS BASED ON 3,000 PSF NET ALLOWABLE SOIL PRESSURE.

D. DO NOT PLACE FOOTINGS OR SLABS AGAINST SUBGRADE CONTAINING FREE WATER, FROST OR ICE.

E. PROTECT PIPES AND CONDUITS RUNNING THROUGH SLABS WITH 1/2 INCH EXPANSION MATERIAL. LOWER CONTINUOUS FOOTINGS AND GRADE BEAMS PERPENDICULAR TO PIPE RUNS TO ALLOW PIPES TO PASS ABOVE THE FOOTINGS. ALTERNATIVELY, PROVIDE A CONCRETE JACKET IF PIPES AND CONDUITS ARE LOW ENOUGH TO BE PLACED BELOW THE FOOTINGS. LOWER FOOTINGS PARALLEL TO PIPE RUNS TO AVOID SURCHARGE ONTO ADJACENT TRENCH EXCAVATIONS.

F. COORDINATE WITH ELECTRICAL CONTRACTOR AND ELECTRICAL ONE-LINE DIAGRAM FOR PROPER BONDING OF THE FOOTING REINFORCEMENT TO THE GROUNDING SYSTEM.

3. CONCRETE

3.1. FORMWORK

A. STANDARDS

1. AMERICAN CONCRETE INSTITUTE (ACI) – GUIDE TO FORMWORK FOR CONCRETE (ACI 347-04)
2. ACI – FORMWORK FOR CONCRETE (SP-4, 2005 EDITION)

B. FORMWORK MAY BE OMITTED FOR FOUNDATIONS PROVIDED EARTH IS FIRM AND STABLE AND CONCRETE SURFACES WILL NOT BE EXPOSED TO PUBLIC VIEW. EXCAVATIONS SHALL BE CUT NEAT AND ACCURATE TO SIZE. LOOSE AND UNSTABLE MATERIALS SHALL BE COMPACTED OR REMOVED. PROVIDE TWO (2) INCHES ADDITIONAL CONCRETE COVER AT SIDES FOR EARTH FORMS WHEN USED IN LIEU OF TEMPORARY FORMWORK.

3. CONCRETE (CONTINUED)

3.2 REINFORCING

A. STANDARDS

1. ACI – SPECIFICATIONS FOR STRUCTURAL CONCRETE (ACI 301-05)
2. CONCRETE REINFORCING STEEL INSTITUTE (CRSI) – MANUAL OF STANDARD PRACTICE, EIGHTH EDITION
3. WIRE REINFORCEMENT INSTITUTE, INC. (WRI) – DESIGN OF SLAB-ON-GROUND FOUNDATIONS, WRI/CRSI-81 WITH 1996 UPDATE
4. ACI DETAILING MANUAL (SP-66 (04))

B. MATERIALS

1. DEFORMED AND PLAIN BARS..... ASTM A615 GRADE 60
2. WELDED WIRE REINFORCEMENT (WWR)..... ASTM A185. PLAIN, 65,000 PSI YIELD STRESS IN FLAT SHEETS.

C. EXECUTION

1. UNLESS NOTED OTHERWISE MAINTAIN THE FOLLOWING CONCRETE COVER FOR REINFORCEMENT.

a. CONCRETE CAST AGAINST EARTH..... 3 INCHES
b. CONCRETE EXPOSED TO THE WEATHER:
#5 AND SMALLER BARS..... 1 1/2 INCHES
#6 AND LARGER BARS..... 2 INCHES
c. CONDITIONS OTHER THAN ABOVE:
#11 AND SMALLER BARS..... 3/4 INCHES
#14 AND #18 BARS..... 1 1/2 INCH

2. ALL REINFORCEMENT SHALL BE SUPPORTED AND HELD IN PLACE BY MANUFACTURED STEEL WIRE BAR SUPPORTS IN ACCORDANCE WITH CRSI. USE OF ANY OTHER MATERIALS WITHOUT WRITTEN AUTHORIZATION BY THE SER IS PROHIBITED.
3. PROVIDE STANDARD 90° HOOKS IN ACCORDANCE WITH ACI 318 UNLESS NOTED OTHERWISE.
4. PROVIDE CLASS "B" REINFORCEMENT SPLICES FOR CONTINUOUS REINFORCEMENT. REINFORCEMENT SPLICES SHALL BE IN ACCORDANCE WITH FOLLOWING TABLE UNLESS NOTED OTHERWISE

TENSION SPLICES (IN)

BAR SIZE	TOP BARS	OTHER BARS	COMPRESSION SPLICES (IN)
#3	21	16	12
#4	28	21	15
#5	35	27	19
#6	46	35	23
#7	62	48	26
#8	82	63	30
#9	80	104	34
#10	131	101	38
#11	162	125	42

COMPRESSION DOWEL EMBEDMENT SHALL BE 22 BAR DIAMETERS. SPLICES FOR WELDED WIRE FABRIC SHALL BE TWO (2) INCHES IN ADDITION TO ONE SPACING OF CROSS WIRES.

5. ALL RE-ENTRANT CORNERS FOR SLAB-ON-GRADE CONSTRUCTION SHALL BE REINFORCED WITH ONE (1) #4 BY 4'-0" LONG (MIN) AT 45° FROM THE SLAB EDGES AND AT SLAB MID-DEPTH.
6. WHERE REQUIRED AND UNLESS NOTED OTHERWISE, PROVIDE DOWELS TO MATCH SIZE AND SPACING OF MAIN REINFORCEMENT.
7. DO NOT WELD OR BEND REINFORCEMENT IN THE FIELD UNLESS SPECIFICALLY SHOWN OR APPROVED BY STRUCTURAL ENGINEER.
8. PRIOR TO FABRICATION, CONTRACTOR SHALL SUBMIT STEEL REINFORCEMENT SHOP DRAWINGS FOR SER'S REVIEW AND APPROVAL. SHOP DRAWINGS SHALL BE CREATED IN ACCORDANCE WITH SP-66 (04).

3.3 CAST-IN-PLACE CONCRETE

A. STANDARDS

1. ACI – SPECIFICATION FOR STRUCTURAL CONCRETE (ACI 301-05)
2. ACI – BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE, (ACI 318-05) AND COMMENTARY
3. ACI – GUIDE FOR CONCRETE FLOOR AND SLAB CONSTRUCTION (ACI 302.1R-04)
4. CODE REQUIREMENTS FOR ENVIRONMENTAL ENGINEERING CONCRETE STRUCTURES AND COMMENTARY (ACI 350-06)

B. MATERIALS

1. PRIOR TO THE PLACEMENT OF ANY CONCRETE, CONTRACTOR SHALL SUBMIT CONCRETE MIX DESIGN(S) PERFORMED BY A QUALIFIED TESTING LABORATORY FOR SER'S REVIEW AND APPROVAL. NO CALCIUM CHLORIDE OR ADMIXTURES CONTAINING CHLORIDES SHALL BE USED IN ANY CONCRETE. MIX MATERIALS SHALL COMPLY WITH THE FOLLOWING:

a. PORTLAND CEMENT..... ASTM C150
b. FLY ASH..... ASTM C618 CLASS C OR F
c. SILICA FUME..... ASTM C1240
d. NORMAL WEIGHT AGGREGATE..... ASTM C33 CLASS 3S
e. WATER..... ASTM C94 POTABLE
f. AIR-ENTRAINING..... ASTM C260
g. WATER-REDUCING..... ASTM C494 TYPE A
h. RETARDING..... ASTM C494 TYPE B
j. WATER-REDUCING/RETARDING..... ASTM C494 TYPE D
k. PLASTICIZING/RETARDING..... ASTM C1017 TYPE II

2. CONCRETE MIXTURES SHALL BE THE NORMAL WEIGHT TYPE (145 PCF) AND DESIGNED PER ACI318-08 USING THE FOLLOWING PARAMETERS:

a. EXTERIOR SLABS ON GRADE:
1) 28 DAY COMPRESSIVE STRENGTH (f'c)..... 4500 PSI
2) CATEGORY F CLASS..... F3
3) CATEGORY S CLASS..... S0
4) CATEGORY P CLASS..... P0
5) CATEGORY C CLASS..... C2

3. CONCRETE (CONTINUED)

3.3 CAST-IN-PLACE CONCRETE

B. MATERIALS

3. CONCRETE SURFACES SHALL BE CURED A MINIMUM OF SEVEN (7) DAYS PER THE USE OF THE FOLLOWING:

a. ABSORPTIVE COVER..... AASHTO M182 CLASS 2
b. MOISTURE-RETAINING COVER..... ASTM C171
c. MEMBRANE-FORMING CURING COMPOUND..... ASTM C309 TYPE I CLASS B
d. MEMBRANE-FORMING CURING/SEALING COMPOUND..... ASTM C1315 TYPE I CLASS A

4. ACCESSORIES:

a. DOWEL AND ANCHOR GROUT: SIKADUR 32 HI-MOD AS MANUFACTURED BY SIKA CORP. OF LYNDHURST, NJ OR APPROVED EQUAL.
b. BONDING AGENT: SIKA ARMATEC 110 EPOCEM AS MANUFACTURED BY SIKA CORP. OF LYNDHURST, NJ OR APPROVED EQUAL.
c. CONTRACTION OR CONSTRUCTION JOINT SEALANT: SIKADUR 51 SL AS MANUFACTURED BY SIKA CORP. OF LYNDHURST, NJ OR APPROVED EQUAL.
d. ISOLATION JOINT SEALANT: SIKAFLEX -1a AS MANUFACTURED BY SIKA CORP. OF LYNDHURST, NJ OR APPROVED EQUAL.
e. VAPOR RETARDER: ASTM E1745 CLASS A
f. PREMOLDED EXPANSION JOINT FILLER (PMF): HOMEX 300 AS MANUFACTURED BY HOMASOTE COMPANY, WEST TRENTON, NJ OR APPROVED EQUAL
g. UNDERSLAB INSULATION: EXTRUDED-POLYSTYRENE PER ASTM C578 TYPE IV, 25 PSI COMPRESSIVE STRENGTH, WITH MAXIMUM FLAME-SPREAD AND SMOKE-DEVELOPED INDEXES OF 75 AND 450, RESPECTIVELY, PER ASTM E 84
h. WATERSTOP: VOLCLAY WATERSTOP-RX AS MANUFACTURED BY CETCO, ARLINGTON HEIGHTS, IL OR APPROVED EQUAL

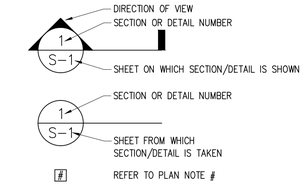
C. EXECUTION

1. COORDINATE PLACEMENT OF CAST-IN-PLACE EMBEDMENTS AND ANCHOR RODS WITH A TEMPLATE. SECURELY ATTACH EMBEDMENT ITEMS TO FORMWORK OR REINFORCING.
2. PLACE CONCRETE IN ONE LAYER OR IN HORIZONTAL LAYERS OF SUCH THICKNESS SO THAT NO NEW CONCRETE WILL BE PLACED ON CONCRETE THAT HAS HARDENED ENOUGH TO CAUSE SEAMS OR PLANES OF WEAKNESS (COLD JOINTS).
3. PROVIDE CONSTRUCTION, CONTRACTION AND ISOLATION JOINTS AS INDICATED ON DRAWINGS. HORIZONTAL CONSTRUCTION JOINTS ARE NOT ALLOWED UNLESS SPECIFICALLY NOTED OR APPROVED BY THE SER. PROPOSED JOINT LOCATIONS THAT ARE DIFFERENT OR IN ADDITION TO THE JOINT LOCATIONS INDICATED ON THE DRAWINGS MUST BE REVIEWED AND APPROVED BY THE SER.
4. SURFACE OF CONCRETE CONSTRUCTION JOINTS SHALL BE CLEANED AND LAITANCE REMOVED. IMMEDIATELY BEFORE NEW CONCRETE IS PLACE, ALL CONSTRUCTION JOINTS SHALL BE WETTED AND STANDING WATER REMOVED.
5. UNLESS NOTED OTHERWISE, CHAMFER ALL EXPOSED EDGES OF CONCRETE 3/4 INCH.
6. BEGIN CURING PROCEDURES IMMEDIATELY AFTER COMPLETING PLACEMENT. CONCRETE SHALL BE PROTECTED FROM PREMATURE DRYING, EXCESSIVELY HOT OR COLD TEMPERATURES AND MECHANICAL INJURY. METHODS OF CURING SHALL BE AS FOLLOWS:

a. MATS, PADS AND SLABS SHALL BE COVERED WITH WATERPROOF SHEETING FOR AT LEAST SEVEN (7) ACCEPTABLE DAYS. A DAY ON WHICH THE "CURING" TEMPERATURE DROPS BELOW 50° IS NOT CONSIDERED TO BE AN ACCEPTABLE DAY. THE "CURING TEMPERATURE" IS CONSIDERED TO BE THE TEMPERATURE OF AIR IMMEDIATELY ADJACENT TO THE CONCRETE.
b. PROVIDE A CONTINUOUS, UNIFORM MEMBRANE BY SPRAY APPLYING TWO (2) COATS OF A CURING COMPOUND TO ALL FORMED SURFACES. APPLY FIRST COAT IMMEDIATELY AFTER STRIPPING FORMS AND AFTER ACCEPTANCE OF THE CONCRETE FINISH. APPLY THE SECOND COAT AFTER THE FIRST APPLICATION HAS SET (±3 DAYS).

8. ALUMINUM MATERIALS ARE NOT PERMITTED TO BE EMBEDDED IN CONCRETE.

LEGEND



0 1 INCH
GRAPHIC SCALE

NO.	DATE	ISSUED FOR BID	BRM	MK
1	7/20/13	COMMENTS	BY	CHKD

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WATER BUILDING
STRUCTURAL NOTES AND LEGEND
WATER SYSTEM IMPROVEMENTS PROJECT
CANASERAGA, ALLEGANY COUNTY, NEW YORK

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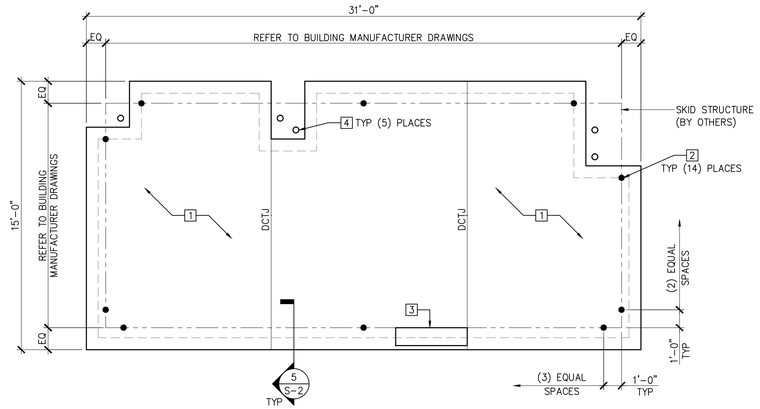
PROJECT NO.: 7400-002



WATER BUILDING MAT FOUNDATION PLAN

SCALE: 1/4" = 1'-0"

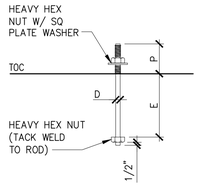
TRUE NORTH

KEYED NOTES:

1. 12" CONCRETE SLAB-ON-GRADE WITH (2) LAYERS #5 @ 12" OC EACH WAY TOP AND BOTTOM OF SLAB. TOP OF CONCRETE ELEVATION TO MATCH SURROUNDING GRADE ELEVATION.
2. TIE DOWN LOCATION. REFER TO DETAIL 5/S-2
3. CAST-IN-PLACE CONCRETE STEP. REFER TO DETAIL 7/S-2. CENTER STEP ON DOORWAY.
4. MECHANICAL PIPING, OMIT CONCRETE AT PIPE LOCATIONS. COORDINATE NOTCH SIZE AND LOCATION IN CONCRETE SLAB WITH BUILDING MANUFACTURER.

SHEET NOTES:

A. COORDINATE PAD AND WATER BUILDING LOCATIONS WITH CIVIL DRAWINGS.
B. COORDINATE MAT FOUNDATION SIZE AND LOCATIONS OF REQUIRED ANCHORS WITH WATER BUILDING MANUFACTURER.
C. EXTERIOR SLABS SHALL HAVE A BROOM FINISH.
D. COORDINATE ALL CONDUIT EMBEDMENTS AND PLUMBING STUB-UP LOCATIONS WITH WATER BUILDING MANUFACTURER, CIVIL PLANS AND DETAILS AND ALL PRIME CONTRACTORS.
E. COORDINATE WITH ELECTRICAL CONTRACTOR AND ELECTRICAL ONE-LINE DIAGRAM FOR REINFORCEMENT BONDING TO GROUNDING SYSTEM.

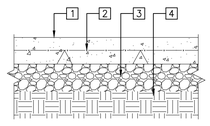


ANCHOR ROD SCHEDULE

MARK	DIAMETER D (IN)	EMBEDMENT E (IN)	PROJECTION P (IN)	WASHER SIZE (IN)	WASHER THICKNESS (IN)	REMARKS
AB1	3/4"	12"	5"	2"	1/4"	-

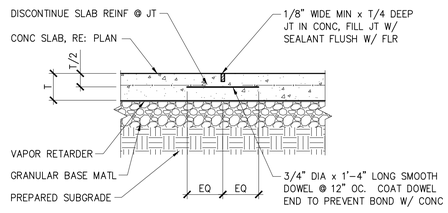
NOTE: 1. ANCHOR RODS SHALL BE ASTM F1554, 36 KSI.
2. PROVIDE MIN THREAD LG EQUAL TO PROJECTION.

1/S-2 TYP ANCHOR ROD DETAIL
SCALE: NTS

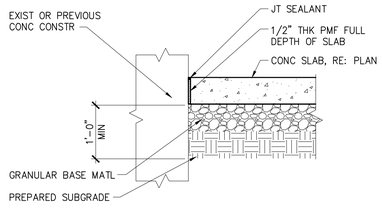


NOTES:
1. CONCRETE SLAB, REFER TO PLAN FOR THICKNESS
2. STEEL REINFORCEMENT, REFER TO PLAN FOR SIZE, SPACING AND LOCATION
3. 6" MINIMUM GRANULAR BASE MATERIAL, REFER TO STRUCTURAL NOTES
4. PREPARED SUBGRADE, REFER TO STRUCTURAL NOTES

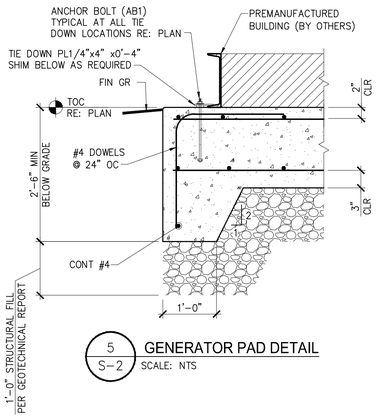
2/S-2 TYP SLAB CONSTRUCTION (UNO)
SCALE: NTS



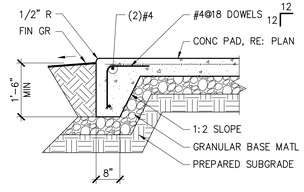
3/S-2 TYP DOWELED CONTRACTION JOINT (DCTJ)
SCALE: NTS



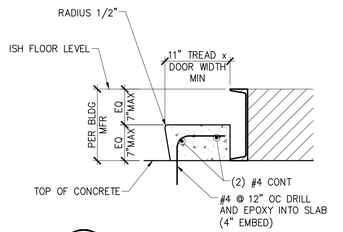
4/S-2 TYP ISOLATION JOINT (IJ)
SCALE: NTS



5/S-2 GENERATOR PAD DETAIL
SCALE: NTS



6/S-2 TYP TURN-DOWN SLAB DETAIL
SCALE: NTS



7/S-2 CAST-IN-PLACE STEP DETAIL
SCALE: 1" = 1'-0"

0 1 INCH
GRAPHIC SCALE

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