



State of West Virginia
 Department of Administration
 Purchasing Division
 2019 Washington Street East
 Post Office Box 50130
 Charleston, WV 25305-0130

Solicitation

NUMBER
DEP16124

PAGE
1

ADDRESS CORRESPONDENCE TO ATTENTION OF
FRANK WHITTAKER 304-558-2316

RFQ COPY
 TYPE NAME/ADDRESS HERE

VENDOR

SHIP TO

ENVIRONMENTAL PROTECTION
 DEPT. OF
 OFFICE OF SPECIAL RECLAMATION
 105 S. RAILROAD STREET
 PHILIPPI, WV
 26416-9998 304-457-3219

DATE PRINTED
08/13/2013

BID OPENING DATE: 08/27/2013 BID OPENING TIME 1:30PM

LINE	QUANTITY	UOP	CAT NO	ITEM NUMBER	UNIT PRICE	AMOUNT
				ADDENDUM NO. 4		
				THIS ADDENDUM IS ISSUED TO:		
				1) EXTEND THE BID OPENING DATE AND TIME TO: 08/27/2013 AT 1:30 PM.		
				2) PROVIDE THE ATTACHED TECHNICAL QUESTIONS AND ANSWERS.		
				3) PROVIDE THE ATTACHED REVISED SPECIFICATIONS AND TABLE OF CONTENTS.		
				4) PROVIDED THE ATTACHED ADDENDUM ACKNOWLEDGMENT.		
				***** END ADDENDUM NO. 4 *****		
0001	1	JB		962-73		
				RECLAMATION: RESTORATION OF WATER		

SIGNATURE	TELEPHONE	DATE
TITLE	FEIN	ADDRESS CHANGES TO BE NOTED ABOVE

WHEN RESPONDING TO SOLICITATION, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'



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LINE	QUANTITY	UOP	CAT NO.	ITEM NUMBER	UNIT PRICE	AMOUNT
***** THIS IS THE END OF RFQ DEP16124 ***** TOTAL:						_____

SIGNATURE		TELEPHONE	DATE
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WHEN RESPONDING TO SOLICITATION, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'

SOLICITATION NUMBER: DEP16124
Addendum Number: 04

The purpose of this addendum is to modify the solicitation identified as ("Solicitation") to reflect the change(s) identified and described below.

Applicable Addendum Category:

- Modify bid opening date and time
- Modify specifications of product or service being sought
- Attachment of vendor questions and responses
- Attachment of pre-bid sign-in sheet
- Correction of error
- Other

Description of Modification to Solicitation:

- 1) Extend Bid opening date and time to: 08/27/2013 at 1:30 PM.
- 2) Provide the attached Technical Questions & Answers.
- 3) Provide the attached Revised Specifications.
- 4) Provide the addendum acknowledgement

Additional Documentation: Documentation related to this Addendum (if any) has been included herewith as Attachment A and is specifically incorporated herein by reference.

Terms and Conditions:

1. All provisions of the Solicitation and other addenda not modified herein shall remain in full force and effect.
2. Vendor should acknowledge receipt of all addenda issued for this Solicitation by completing an Addendum Acknowledgment, a copy of which is included herewith. Failure to acknowledge addenda may result in bid disqualification. The addendum acknowledgement should be submitted with the bid to expedite document processing.

ATTACHMENT A

**Addendum #4 - Questions
For DEP 16124
Omega Mining Co., Inc.
Permit # D-79-82**

The following questions were provided to purchasing. The answers provided herein take precedence over verbal answers at the PBC should there be any conflicts between the two.

- 1.) Q. Many items on the project have differing specifications or no specifications, such as the Rock Check Dams Specification 5.2.4 which reads "6 inch riprap stone shall be placed inside ditches as shown on the". Then in Section 5.4 the specification states "the check dams will be constructed in accordance with the Plans". No indication is on the plans as to a location of said items other than the detail on Page 16 of the Plans.
A. The specifications have been updated and are attached. The specifications refer to the plans on sizing and spacing of the check dams. The specifications now state that the check dams shall be installed as needed and approved by WVDEP onsite representative.
- 2.) Q. Next, there is no specification for the HDPE pipe used for the ponds and AMD Plant. In the specifications the only pipes mentioned for the AMD Plant are ductile iron, pvc, and steel casing. Page 24 of the plans shows a Conduit Legend stating the thickness of 4" HDPE; however there is no mention of thickness for 3", 6", 8", and 12" HDPE pipe.
A. The 12" HDPE pipe which is used as culvert is referenced in the Specifications' Section 7.0.2.4. Specifications 12.94 HDPE FUSION PIPE AND FITTINGS has been added. All HDPE Fusion pipe and fittings shall have a minimum rating of DR-17.
- 3.) Q. Finally, in Addendum Number 1, Question 28 states that "sludge should either be disposed of by means of a vacuum truck to a specified location, or trucked to an off-site location. WVDEP will provide trucking if sludge cannot be transported by vacuum truck." This language makes it unclear as to the location of sludge disposal and whether the contractor or the WVDEP is responsible for the costs associated with vacuum trucks and disposal.
A. The contractor is responsible for preparing and loading the sludge into the dump trucks when the sludge cannot be removed by a vacuum truck. Trucking of the sludge by means of vacuum or dump to an offsite location shall be the responsibility of the WVDEP.
- 4.) Q. While visiting the site I noticed an ammonia line running down the slope where the new Main Entrance Road will be, who is responsible for removal of this ammonia line?
A. The contractor is responsible removing the line after the new facility is operational and temporary treatment ceases.
- 5.) Q. It seems that various lines, both ammonia and water, are found throughout the site above and below ground. Would it be possible to end treatment with ammonia during excavation of this project for safety?
A. No
- 6.) Q. Page 34 of the Plans shows a pipe entering the mixing tank at an elevation of 5' above the pad grade of 1380'. Is this correct that the pipes between the Smartditch and the mixing tank will be 5' in the air?
A. Please refer to NOTE of Sheet 62 of plans.

**Addendum #4 - Questions
For DEP 16124
Omega Mining Co., Inc.
Permit # D-79-82**

- 7.) Q. An existing sewer line intersects the Main Entrance Road along with various proposed pipe trenches. Section 10.6 of the Specs state "pay item amounts for utility relocation and extension have been included on the Bid Schedule". Where on the bid schedule is this pay item?
A. The only utility to possibly be encountered is the wastewater plant effluent line, which is SDR-35 pipe. This line is new and well-marked with cleanouts to the surface. The line was installed to a depth below excavation levels to be encountered in this project.
- 8.) Q. Section 5.0 of 0.4 Special Provisions states "WVDEP requires that minimal treatment of the acid mine drainage continue during construction of the facility." What does minimal treatment entail?
A. The continued treatment with ammonia at the newly expanded final pond for sedimentation. The contractor is responsible for temporary movement of the chemical lines and AMD conveyance lines. The WVDEP shall be responsible for chemical adjustment, chemical purchase and sludge removal by vacuum truck.
- 9.) Q. Can contractor make temporary lined diversion ponds and move the treatment process to these or does treatment have to continue at the current location?
A. As explained at the pre-bid while standing at the final pond, the pond shall be expanded, lined, and used as temporary treatment while the clarifier is being constructed.
- 10.) Q. Can contractor modify existing sludge containment ponds and use them?
A. The ponds may be used to dewater sludge from existing ponds.
- 11.) Q. Does the WVDEP own surface rights throughout the entire site or will waste/borrow agreements, fees, etc need to be considered, and if so, what bid item will this fall under?
A. The work area is either owned by the WVDEP or the WVDEP has right of use based on previously bonded area from the mining permit.
- 12.) Q. Plan pages 60-63 indicate cleaning of all existing facility ditches. Will these ditches receive riprap or erosion matting?
A. No
- 13.) Q. Can brush barrier be used as an alternative to silt fence or must all brush be burnt?
A. Silt fence must be used, and all brush must be burnt or chipped.
- 14.) Q. Can material that is undercut below the AMD Plant site be used for backfill around the sides of AMD Plant structures?
A. Yes, pending onsite approval as the material is excavated.
- 15.) Q. Section 7.07.3.1A.5 of the specs indicate pipe shall be tested during construction at 100 foot intervals. Does this mean all pipe incidental to the AMD Plant needs tested every 100 feet installed including pipes connecting ponds?
A. No, only the enclosed piping collecting raw AMD.

**Addendum #4 - Questions
For DEP 16124
Omega Mining Co., Inc.
Permit # D-79-82**

- 16.) Q. If ponds need to be undercut prior to liner placement is soil backfill acceptable or will lean concrete have to be used? Also, would this material need hauled off site to approved locations?
A. Yes, pending onsite approval as the material is excavated. Any soil used under the liner shall not contain rocks greater than 3" in size.
- 17.) Q. Will a protective fabric be required between the bin blocks and the pond liner in the final treatment pond?
A. No, plans show a concrete footer for the bin blocks below the liner and the bin blocks will be encapsulated with the liner as shown on the plans.
- 18.) Q. It is noted in the Specs Section 12.26 1.1 "Geotube Concrete Slab", but the Plans show the use of 1.5" clean aggregate. Which material is to be used?
A. The Geotubes shall rest on the clean aggregate.
- 19.) Q. Section 12.36.3.2J in the Specs state "deviation from designed grade as shown on the contract drawings will be cause for rejection." Are there grade requirements or pipe details other than influent and effluent elevations?
A. No, the contractor shall meet the elevation requirements.
- 20.) Q. Section 13.26.3.4B in the Specs states sewer laterals shall have cleanouts at minimum 100 feet intervals for 12" pipe. Would all pipe incidental to the AMD Plant be considered sewer, other than that listed for non-potable water? If so what are the maximum intervals for 6", 8", and 12" pipe?
A. This specification pertains to all enclosed AMD collection lines and domestic wastewater lines. For AMD lines, cleanouts shall be every 100 feet regardless of line size. The raw wastewater line shall require a cleanout immediately outside of the building.
- 21.) Q. Are there specifications for the septic tank drain field infiltrator chambers or should the contractor refer to the county health department? Also, will the contractor need to apply for permits?
A. The contractor shall use Infiltrator Chambers or equivalent and installed to WV Health Department Guidelines. The contractor is not responsible for any permitting associated with the drainfield system.
- 22.) Q. Has an asbestos inspection been performed on the structures scheduled to be abandoned?
A. No
- 23.) Q. Section 3.1.A.3 indicates contractor is responsible for snow removal every 2", does this mean contractor has to remove snow during winter shutdown?
A. No
- 24.) Q. Will a Liner Inspector be required for pond lining installation?
A. Refer to Specification 16.0 Polyflex Liner 1.2.2 Installation.

**Addendum #4 - Questions
For DEP 16124
Omega Mining Co., Inc.
Permit # D-79-82**

- 25.) Q. There is no mention of compaction requirements for pond embankments nor means of compaction, will a sheep foot and smooth drum vibratory compactor be required or just a smooth drum vibratory compactor?
A. Refer to Specification 4.02 Access Roads 4.02.2.2. This specification shall be used for pond and geotube pad embankments.

CLARIFICATION FOR SPECIFICATIONS: The attached specifications listed (Section 5-0, 18-0, 12-26, 12-80, and Table of Contents) has been revised for this project. Specification Section 12.94 has been added.

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5.0 SEDIMENT CONTROL

5.1 DESCRIPTION

This item shall consist of furnishing all materials, equipment, labor and incidentals necessary for the installation of silt fence or straw bale sediment control structures as designated in the Drawings. Sediment control shall be placed on regraded outslope areas concurrent with construction and prior to revegetation. Additional quantities may be added at the discretion of the WVDEP.

The Contractor shall submit an erosion and sediment control plan to the WVDEP at the pre-construction meeting for approval. This plan shall include measures to be utilized for temporary and permanent erosion and sediment control. This plan shall also include the measures as outlined herein. The WVDEP's approval of this plan does not relieve the Contractor of his responsibility to be in compliance with any and all permits. All costs associated with meeting the Federal and/or State Regulations shall be the sole responsibility of the Contractor.

5.2 MATERIALS

- 5.2.1** Silt fence shall be utilized on perimeter barriers and internally as shown on the plans. Silt fence shall be properly removed after permanent vegetation has been established, as directed by the WVDEP designated on-site representative. Silt fence materials and installation shall meet all applicable requirements of Section 715.11.5 and 642.6 of the West Virginia Division of Highways **Standard Specifications for Roads and Bridges**, Adopted 2010.
- 5.2.2** Alternate: Bales: The bales shall be standard size square bales consisting of hay or straw bound with a natural fiber twine. The bales shall meet all applicable requirements of Section 715.27.1 of the West Virginia Division of Highways **Standard Specifications for Roads and Bridges**, Adopted 2010 pertaining to ingredients. Each bale shall weigh minimum of 50 pounds
- 5.2.3** Stakes: The stakes shall consist of 2" X 2" stakes, 36 inches in length made from suitable hardwoods. Other methods of anchoring may be used if specifically approved by the WVDEP.
- 5.2.4** Rock Check Dams: This barrier constructed of clean, non-erodible 6" Rip Rap Stone shall be placed inside ditches based on design calculations given on the plans.

5.3 Maintenance

During the course of the project, sediment control structures shall be maintained in sound condition and accumulations of silt that may threaten effectiveness shall be removed. Silt removed from the sediment control structures shall be taken to an approved disposal area.

5.4 Installation

The hay or straw bales utilized as Sediment Control Barrier shall be installed end to end along the contour at the locations shown on the Drawings or as approved by WVDEP. Bales shall be anchored utilizing two stakes per bale. The first stake in each bale shall be angled toward the previously anchored bale and the second stake shall be driven vertically. The stakes shall penetrate a minimum of 12 inches into the ground.

Rock Check Dams shall be constructed and placed as needed and approved by the WVDEP onsite representative.

5.5 METHOD OF MEASUREMENT

5.5.1 The method of measurement for Sediment Control Barrier installation and maintenance in conformance with the specifications and accepted by the WVDEP shall be on a per linear foot basis to include bales, stakes, all necessary materials, supplies, labor and equipment for installation and maintenance including sediment removal and disposal.

The method of measurement for Rock Check Dam installation and maintenance in conformance with the specifications and accepted by the WVDEP shall be by an each basis to include all necessary materials, supplies, labor and equipment for installation and maintenance including sediment removal and disposal

5.5.2 Any additional sediment control, i.e. sediment traps, sumps etc., installed by the contractor to meet any applicable State or Federal Law or Regulation shall be the Contractor's sole responsibility and all costs pursuant thereto shall be borne fully by the Contractor. However, any additional straw bale sediment control approved by the WVDEP prior to placement shall be included for measurement.

5.6 BASIS OF PAYMENT

The quantity of work completed will be paid at the contract unit price bid for the following items, which price and payment shall be full compensation for all

materials, labor, equipment and incidentals necessary to perform the work. Additionally, payments shall constitute full compensation for any required maintenance, sediment removal and disposal.

5.7 PAY ITEM

"Sediment Control", per linear foot.

"Rock Check Dam", per each

END OF SECTION

12.26 GEOTUBE DEWATERING TUBES

PART 1 - GENERAL INFORMATION

1.1 Description

A. Scope. The work covered by this section consists of furnishing and installing seven (7) each measuring 45' diameter by minimum of 135' length geotextile tubes on the Geotube Aggregate for dewatering of water treatment sludge.

B. General. The Contractor shall furnish the Geotube dewatering tubes by positioning them as shown on the plans.

1.2 Quality Assurance

Manufacturer Qualifications. All Geotube dewatering tubes and ancillary products shall be the standard product of a manufacturer who has been regularly engaged in the integral design, manufacture, and fabrication of the products, and whose product has proven reliable in similar service for 5 years. The Geotube dewatering tubes manufacturer must be ISO 9001 certified and can provide a current ISO certification. The Geotube dewatering tubes manufacturer must have an internal testing lab that has a current A2LA accreditation.

1.3 Submittals

A. Plan of Construction

The contractor must submit prior to award of contract:

1. A detailed Plan of Construction. This plan shall include, but not be limited to, site plan, dewatering containment cell, Geotube dewatering tubes layout, etc.
2. A copy of the manufacturer's installation instructions detailed for this project.
3. A copy of the (RDT) Rapid Dewatering Test or (GDT) Geotube Dewatering Test report for the specific material to be dewatered.
4. Submit shop drawings of the materials, equipment, and method of installation details for the complete system.
5. Submit manufacturer's product literature and specifications for materials) utilized to construct Geotube dewatering tubes, including Filling Port details, connection details, site layout, piping, manifold, and related components.
6. Provide a mass balance of the pumping flow rates, chemical make-down, amount of dilution water, filtrate volume, density measurement, and percent solids — all integrated into a real time control system, showing a method of collection, and discharge point.
7. Details and layout of the dry or emulsion polymer make-down and metering system, if required.

12.80 NON-POTABLE WATER PUMP STATION

PART 1: GENERAL REQUIREMENTS

SCOPE OF WORK

The contractor shall furnish and install one (1) - factory built, factory delivered, above-ground water booster pump station in a fiberglass tiltback enclosure on a steel base with all necessary internal piping, valves, fittings, supports, pumps, motors, controls, and other necessary appurtenances as shown on the plans and specified herein.

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.

The station and enclosure shall be installed over a wet well (supplied others). The pumps shall be vertically tank mounted wet pit pumps. The motors, discharge piping and all other controls and instrumentation shall be above grade and assembled on the station.

CONTRACTOR INSTALLATION REQUIREMENTS

The contractor shall be required to set the station on the foundation designed by the engineer shown in the plan set. The foundation shall be built by the contractor and as directed by the engineer. Following setting of the station, the contractor will be required to anchor the station to the foundation. The contractor shall supply the anchor bolts.

BASIS OF DESIGN MANUFACTURER (STANDARD UP FRONT FOR BID)

The BASIS OF DESIGN station equipment is by Engineered Fluid, Inc. having been deemed to represent the minimum level of quality, performance and service acceptable for this equipment. Engineered Fluid, Inc. is represented by Mr. Danny Lusk of WC Weil Company, telephone 304-776-5665.

ALTERNATE MANUFACTURERS

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.

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.

PRE-BID SUBMITTAL DOCUMENTS

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.

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.

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

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 pump station and with One (1) electronic copy on CD placed inside the three ring binder in a suitable pocket.

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.

POST BID SUBMITTAL

Equipment submittals shall be bound and in a minimum of two (2) hard paper copy bound and two (2) electronic copies on CD. The submittals shall contain a minimum of two (2) full size drawings, size 24" x 36"; one (1) each covering the booster pump station and the electrical control schematic. The booster pump station drawing shall be specific to this project, in at least three (3) different views, be to scale. The submittal booklets will be complete with data sheets covering all major components that make up the booster pump 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.

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.

QUALITY ASSURANCE

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.

SHIPPING AND DELIVERY

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

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.

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

SPECIFIED COMPONENTS

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.

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

No other components other than those listed are acceptable.

FACTORY START-UP AND TRAINING SERVICE

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

MANUFACTURER'S WARRANTY

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.

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.

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.

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

GENERAL LIABILITY INSURANCE

The water distribution station manufacturer shall furnish premises/operations and products/completed operations general liability insurance from an insurance company with a rating of A-V according to the most recent Best's Key Rating Guide, in an amount equal to \$10,000,000 per occurrence.

The insurance certificate must be included with the manufacturer's submittal. The coverage must be provided by an insurance carrier licensed and admitted in the state of manufacture.

PART 2: PRODUCTS AND COMPONENTS

TILT-BACK, ON GRADE EQUIPMENT COVER AND BASE

The pumps, valving, controls and related Equipment shall be provided complete to the jobsite ready for connection of the inlet and outlet piping and electrical connection.

The station shall be made of a steel welded base and two tilt-back fiberglass covers.

TILT-BACK EQUIPMENT BASE

The equipment base shall be one completed unit when delivered. Field welding to complete the structure or attach the internal piping system will not be acceptable.

The steel plate and structural shapes used must be adequate to meet the purpose for which they are intended plus the additional stresses from the lifting and setting of the equipment. The equipment base design shall accommodate both lifting from above the unit by a hoist or crane and lifting from below by a fork lift.

The plate steel employed throughout the equipment base shall meet or exceed the requirements for ASTM A-36. 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 design of all members shall be in accordance with the recommended practice for design as specified in the MANUAL OF STEEL CONSTRUCTION, published by the American Institute of Steel Construction, Inc.

TILT-BACK EQUIPMENT COVER

The equipment enclosure shall be a hand layup, molded fiberglass cover of the size and shape shown. The cover shall match the size of the equipment base so to overlap the edges of the Equipment Base when lowered over it.

The Equipment Cover shall contain the following elements in its fabrication:

1. Resins - Resins shall be thermosetting, medium reactivity, rigid fire resistant polyester containing maximum monomer content of 42% and a maximum of 11% Thixotropic additive.
2. Glass Fiber - Glass Fiber reinforcement shall be K filament type E Borosilicate glass having high performance chrome-complex or silane finish compatible with polyester resins.
3. Gelcoat - Exterior surface coating shall be ultraviolet light stabilized,

weather resistant, polyester base containing fade resistant color pigments, and such inert extenders as are appropriate to maintain total pigment volume concentration less than 20%.

3. Interior Coating - Interior laminate coating when required shall be a pigmented heat resistant high gloss polyester base surfacing sealer.

The equipment cover shall provide a minimum R value of 14-19.

The equipment cover shall be attached to the Equipment Base by hinges at one end. A minimum of three (3) butt type hinges shall be used and each hinge will have a removable hinge pin. The hinges will be affixed to the cover by bolting and be complete with a full span aluminum backing bar. Bolts and nuts of the hinging system will not directly bear on the fiberglass cover, but bear only on each hinge and the backing bar. The hinges will allow the cover to open fully to expose all interior equipment.

Two (2) inert gas over oil spring-loaded opening assist automatic cylinders shall be attached to each equipment cover and the equipment base to counterbalance the weight of the fiberglass cover and ease the opening and closing function. The cylinders shall have an internal orifice controlled valve that dampens the extension motion but that permits un-dampened compression.

The equipment cover shall be secured from unauthorized entry by a simplex, weather resistant padlock system. Where more than one (1) cover is used or more than one (1) station is supplied, the padlocks will be keyed alike. Two (2) keys will be provided for each padlock, with each set of keys on a key ring complete with the manufacturer's identification and service telephone number.

The Equipment Cover shall be complete with a minimum of one (1) galvanized lifting handle. The handle will be affixed to the long side of the cover. The handle will be so located as to allow the equipment enclosure cover to be easily tilted to expose completely the mechanical/electrical equipment contained therein. The handle will be bolted through the cover and through an aluminum backing bar.

PUMP OPERATING CONDITIONS - PUMP STATION

The pump station shall be capable of delivering the fluid medium at the following capacities and heads when operating at 0 feet minimum suction pressure.

PUMP #1

The pumps shall be Vertical Turbine by Flowserve as Model 6EJY/6EJH.

Design Point: 50 GPM @ 171 feet TDH;
 Maximum Point: 75 GPM @ 160 feet TDH;
 NPSHr: 2 feet;
 Suction Pressure: 0 PSI;
 Discharge Pressure: 78 PSI;
 Pump Efficiency at Design Point: 68%

Pump Power: Non-overloading for 5 rated h.p.
Motor Speed: 1750 rpm nominal..
Electrical Power: 480 volt 3 phase, 60 cycle

PUMPS - VERTICAL TURBINE

The pumps shall be supplied with a Cast, flange mounted discharge head with a size (4) inch size discharge flange with 125 lbs drilling. The top diameter of this head shall be of such diameter as to match the diameter of the motor base to distribute the load uniformly.

The discharge head will be complete with a high pressure, stuffing box with suitable packing. The head shall be fitted with a suitable packing gland drain connection.

Pump drains shall be piped to the floor drain.

The suction case, intermediate bowls and discharge bowl shall be of cast iron, free of foundry imperfections and other detrimental defects. Bowls may be furnished with replaceable bronze seal rings on the suction side of the impellers. Bowls shall be furnished with full waterway, porcelain lining.

The exterior of the bowls, the waterway of the pump head and interior/exterior of column pipe, if applicable, shall be coated with Tnemec N140 Pota-Pox® Plus polyamidoamine epoxy or approved equal. The coating shall be certified by NSF International in accordance with ANSI/NSF Std. 61.

The impellers shall be of bronze and statically balanced. They shall be securely fastened to the impeller shaft with steel collets.

The impellers shall be adjustable vertically.

The pump shaft is to be turned and ground stainless steel having chromium content of not less than 12%. It shall be supported by bearings above and below each impeller. The suction case bearing is to be bronze and grease lubricated. Intermediate bowl bearings are to be lubricated by water being pumped and may be of bronze, rubber or a combination of bronze and rubber. The size of the shaft shall be ample to transmit the horsepower required by the pump.

A suitable non-reverse coupling shall be provided to connect the vertical hollow shaft motor head shaft to the motor. The coupling shall be so designed as to form a unit with the head shaft impeller adjustment nut so as to provide variable adjustment to the pump impellers. The coupling shall be bolted down to prevent pump damage from momentary hydraulic imbalance.

Various pump manufacturers will provide different materials for different component parts; this condition is a tolerable variance from manufacturer to manufacturer.

PUMP MOTOR CONFIGURATION

The pump driver shall be a NEMA Design B, three phase, alternating current,

induction motor, continuous duty rated, high thrust design with motor insulation as Class F for Class B Heat Rise.

Motor efficiencies shall be Premium Efficient as stated in NEMA MG 1, 2011 Part 12, Table 12-12 for the motor enclosure, open or closed.

Motor Service factor shall be 1.15 on the nameplate, reduced to 1.0 when used with variable frequency drives per NEMA MG 1 – 2011, Part 31.3.7.

The motor enclosure shall be, Weather Protected Machine - Type I (WP-1) enclosure with a vertical hollow shaft drive with non-reverse ratchet assembly. Vertical hollow shaft motors shall be provided with a steady bushing.

Motors of 600 volts or less shall meet the requirements of NEMA MG 1 2011 Part 31.4.4.2 for ability to sustain voltage spikes when used with variable frequency drives under usual conditions.

PIPING-TRANSMISSION

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.

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.

The piping sizes shall be as shown on the drawing.

Size 10 inch and below - Schedule 40

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

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

PIPE WELDING

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.

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.

PIPE SURFACE PREPARATION

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.

PIPE CUTTING

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

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.

SADDLE CUTS AND WELDS

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.

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.

PIPE WELDING TECHNIQUES

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.

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

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.

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

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.

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

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.

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

WELD STANDOFFS

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

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.

FLOOR PENETRATION COATING PROTECTION SLEEVE

Where a fusion bonded epoxy interior coated pipe passes through the steel floor, prior to fusion bonded coating of that pipe, a pipe sleeve shall be welded over the pipe in the area where the pipe passes through the steel sheet.

The sleeve shall be one-half (1/2") inch thickness and fit closely over the transmission pipe. The sleeve shall be seal welded to the transmission pipe at each end with a full and continuous fillet weld.

Following the welding of the sleeve to the transmission piping, the sleeve welds and the sleeve shall be grit blasted to an SP-6 finish so the pipe is prepared for fusion bonded epoxy coating by the process specified elsewhere in these documents.

PIPE SUPPORTS

Pipe supports by minimum sizing for:

- 8" and smaller piping shall be 2" x 3" x 3/16" wall rectangular tubing;
- 10" and larger piping shall be 3" x 4" x 1/4" wall rectangular tubing;
- 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.

Pipe supports are to be fully welded at both end points to the pipe and steel floor where required.

Where components are to be supported and may require disassembly at some time, the supports for these components shall be welded at the bottom and bolted at the top by use of a bolt yoke welded to the top of the support and bolted into the flange connection picking up at least three bolts.

FUSION BONDED EPOXY INTERNAL PIPE COATING

The internal surfaces of piping to be fusion bonded coated shall be grit blasted to an

SP-10 finish with the finish profile required by the coating material manufacturer.

The internal, wetted surfaces of the steel transmission piping shall have applied to it a Fusion Bonded Epoxy Coating on the interior pipe surface. The coating shall be applied and meet the testing requirements of Table 1 and Table 2 with the exception of Table 2 section 7 per AWWA C-213.

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

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

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:

- Date of application;
- Material manufacturer and product designation including a product data sheet for the coating;
- Applier of the fusion bonded coating, name, address and phone number;
- 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.

COATINGS - CORROSION PROTECTION

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.

WELDMENT PRIME COATING

All weldments will be pretreated by hand to provide additional corrosion protection using the same product as the base coat. Following the pretreatment full coating application shall take place.

BASE COATING

The base coating shall take place immediately after surface preparation. The protective coating shall consist of a two-component, high solids, high build, fast drying epoxy system for protection and finishing of steel and having excellent corrosion resistant properties. The epoxy system shall be self-priming and require no intermediate coatings.

TOP COATING

Following the base coating application, a full finish coating application shall take place. The protective coating shall consist of a two-component, high solids, high build, fast drying epoxy system for protection and finishing of steel and having excellent corrosion resistant properties. The epoxy system shall be self-priming and require no intermediate coatings. The base and finish coats shall provide a total dry mil thickness of 8.0 mils.

POST-ASSEMBLY COATING

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

SERVICE CONNECTIONS ON INTERNAL PIPING

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.

RESTRAINING POINTS

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)(the exterior piping)(the capsule wall adjacent to the pipe penetration) as shown to facilitate the attachment of joint restraint tie rods or other device to be used in retarding any pipe movement at the connections.

COMPRESSION COUPLINGS

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) may be used.

Grooved fittings may not be used under any circumstance.

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

LINE PRESSURE GAUGES

Combination pressure gauges shall have a built-in pressure snubber and have 4-1/2" minimum diameter faces and turret style case, black fiberglass-reinforced thermoplastic with a clear acrylic window with Buna-N gasket. The 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:

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

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

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

STATIC AND SENSING LINES

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

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

SAMPLE TAP

A single, right angle outlet, smooth nose, brass sample tap shall be affixed to the manual vent ball valve for the low suction lockout and suction pressure gauge assembly.

HOSE BIBB WITH VACUUM BREAKER

There shall be provided a standard hose bibb with valve and vacuum breaker on the suction piping. The hose bibb connection shall be through a pressure regulator if the header pressure would exceed 60 psi.

BALL VALVES

For piping of less than 3" size ball valves shall be used. The ball valves shall meet or exceed ASTM Spec B124 No. C37700. The ball valves will be 2-piece forged brass body, blow out proof stem, TFE seats, TFE packing with adjustable stem packing gland. The valves will be NPT threaded pattern complete with lever operators. Maximum working pressure shall be 600 psi.

BUTTERFLY VALVES

Valve body shall be wafer style, for ANSI Class 125/150 flange bolting and have a metal reinforced, dovetail seat for drip-tight, bi-directional shutoff. The valve stem shall be one piece connected to the disk by stainless steel torque plugs with upper and lower RTFE inboard stem bearings and heavy duty upper stem bushing.

The valve body shall be cast iron with stainless steel disk and stem, EPDM seat, polyester upper stem bushing and NBR stem seal.

6" and smaller valves shall be equipped with a lever operator with 10 degree throttle stops. 8" and larger valves shall be equipped with a weatherproof, heavy duty handwheel gear operator.

Valve manufacturer:

- A. Keystone 221-786
- B. Nibco WC-1020-3

MANUAL VALVE ACTUATORS

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.

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.

SILENT CHECK VALVES – WAFER STYLE

Silent check valves shall be wafer style, non-slam and made to set between ANSI Class 125 flanges.

Sizes shall be as shown. (2" – 10")

The body of the check valve shall be cast iron. The plug and seat shall be bronze and conform to ASTM Designation B-584. The seat shall contain a Buna-N seal to provide zero leakage. The seal design shall provide for both a metal to metal low and high pressure without over-loading or damaging the Buna-N seal. The guide bushings shall be bronze copper alloy and conform to ASTM Designation B-584. The valve spring and seat retainers shall be stainless steel and conform to ASTM Designation A-313. The valve plug shall be guided at both ends by a center shaft integral with the valve plug. Alignment of the center shaft shall be provided by guide bushings.

Silent Check Valve manufacturer:

- A. Val-Matic Model 1400
- B. APCO Series XXX
- A.

HYDRAULIC ACTUATED CONTROL VALVES - GENERAL

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

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

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

The pilot control system shall include CK2 isolation valves.

The pilot system shall include an opening speed control on all valves.

Pilot controlled sensing shall be upstream of the pilot system strainer so accurate control may be maintained if the strainer is partially blocked.

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

The Control Valve shall be a Cla-Val Model 50-01BKCKD

COMBINATION AIR VACUUM RELEASE VALVES

Combination air valves shall be of the single housing style that combines the operating features of both an air/vacuum and air release valve and be placed as shown on the drawings and of the size shown.

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

The air release portion shall automatically release small pockets of air from the pipeline while the pipeline is in operation and under pressure.

The combination air valve shall be 1" NPT inlet and outlet connections and a 5/64" diameter orifice for a minimum working pressure of 300 psi.

The materials of construction shall be: body, cover and baffle of cast iron; float and all other trim shall be of stainless steel with the exception of the Buna-N seat and adjustable viton orifice button.

The combination air valve shall be Val-Matic Model 201.C.

PRESSURE TESTING

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.

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.

ELECTRICAL DESIGN, ASSEMBLY & TEST

The electrical apparatus and control panel design, assembly, and installation, and the integration of component parts will be the responsibility of the manufacturer of record for this 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.

CONFORMANCE TO BASIC ELECTRICAL STANDARDS

The manufacturer of electrical control panels and their mounting and installation shall

be done in strict accordance with the requirements of UL Standard 508A and the National Electrical Code (NEC), NFPA 70 latest revision so as to afford a measure of security as to the ability of the eventual owner to safely operate the equipment.

No exceptions to the requirements of these codes and standards will be allowed; failure to meet these requirements will be cause to remove the equipment and correct the violation.

U.L. LISTING

All service entrance, power distribution, control and starting equipment panels shall be constructed and installed in strict accordance with Underwriter's Laboratories (UL) Standard 508A "Industrial Control Equipment." The UL label shall also include an SE "Service Entrance" rating stating that the main distribution panel is suitable for use as service entrance equipment. The panels shall be shop inspected by UL, or constructed in a UL recognized facility. All panels shall bear a serialized UL label indicating acceptance under Standard 508A and under Enclosed Industrial Control Panel or Service Equipment Panel.

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

E.T.L. LISTING

All control panels shall be E.T.L. Listed by Interek Testing Services (ITS) under the Industrial Control Panel (ICP) Category. Each completed control panel shall bear an ETL listing label stating that the panel conforms to UL STD 508A and is certified to CAN/CSA STD C22.2 NO. 14. The listing label shall include the station manufacturer's name, address and telephone number. The station manufacturer shall have quarterly inspections performed by ETL at the manufacturer's facility to ensure that the products being listed comply with the report and procedural guide for that product.

EQUIPMENT GROUNDING

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

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

PANEL MOUNTING HARDWARE

Metal framing channel and hangers shall be used exclusively for mounting of electrical

panels and electrical components except for those specifically designated otherwise.

When mounting panels in buildings with 3/4" plywood interior sheathing, certain panels and components may be mounted by screwing these devices into the wall. The maximum weight of a panel mounted with four lag screws cannot exceed 250#. The lag screws must either be 5/16" or 3/8" diameter and be fully threaded.

ELECTRICAL SERVICE

The electrical service provided for this station will be 480 volt, 3 phase, 60 Hertz, 4 wire.

ELECTRICAL APPARATUS - CONTROL PANEL

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

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

- One (1) Main Breaker, 100 amps;
- One (1) Branch Breakers, pump
- One (1) Transformer Breaker, Primary Side
- One (1) Transformer Breaker, Secondary Side;
- One (1) Phase Monitor Breaker, 15 amps;
- Seven (7) Auxiliary Circuit Breakers, as follows:
 1. Controls
 2. Exhaust Fan
 3. Exhaust Fan
 4. Heater
 5. Heater
 6. Convenience Outlet
 7. Spare

ELECTROMECHANICAL CONTACTOR MOTOR STARTERS

Where designated, those motors shall be controlled by using combination electromechanical contactor motor starters. The motor starters device(s) shall be combination motor starters and overload protection devices as full voltage, non-reversing designated for AC motor starting being rated for continuous duty.

The operational voltage shall be 480 volts, three phase.

The electromechanical combination motor starters shall be IEC rated.

ELECTRICAL POWER TRANSFORMER

Balanced 115/230 single phase power for the auxiliary circuits within the scope of each booster station shall be obtained by use of a 7.5 KVA dry, step down transformer. The transformer shall be wall mounting type, in a NEMA 3R non-ventilated weatherproof

enclosure. Transformer shall operate with noise levels equal to or less than ANSI and NEMA standards. Transformer insulation shall be Class 180c.

The transformer shall meet the most recent standards for efficiency.

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

ALARMS CONDITION AND OUTPUTS

The following alarms/status points shall be included within the booster pump station and wired back to the interface panel:

1. Phase fail/power status alarm – The phase fail alarm shall be provided by 120 volt AC relay.
2. High Station Temperature Alarm – The station high temperature alarm shall be provided by a 120 volt AC relay controlled by a thermostat in the station.

PUMP MOTOR RUN TIME METER

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

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

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

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

ELECTRICAL PHASE MONITOR

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

When a fault is sensed, the monitor output relay opens within two seconds or less to turn the equipment off and/or cause an audio or visual alarm. Both Delta and Wye systems may be monitored. The monitor shall have an automatic reset and shall also include an adjustable voltage delay.

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

SURGE PROTECTION DEVICE

A secondary surge arrester shall be provided. Housing shall be Noryl and be ultrasonically sealed. Valve blocks shall be metal oxide with an insulating ceramic collar. Gap design shall be annular. The lead wire shall be permanently crimped to the upper electrode

forming part of the gap structure.

Arresters shall be UL and CSA listed Lightning Protective Devices.

ELECTRICAL CONDUIT AND WIRING

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

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

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

Devices and appliances where furnished by the original manufacturer and being equipped with a UL approved rubber cord and plug, may be plugged into a receptacle.

Equipment enclosure conduits shall be rigid, heavy wall, Schedule 40 PVC with solvent weld moisture-proof connections, in minimum size 3/4" or larger, sized to handle the type, number and size of equipment conductors to be carried.

The conduiting shall be in compliance with Article 347 of the National Electrical Code and NEMA TC-2, Federal WC-1094A and UL-651 Underwriters Laboratory Specifications.

Where flexible conduit connections are necessary, the conduit used shall be Liquid-tight, flexible, totally nonmetallic, corrosion resistant, nonconductive, U.L. listed conduit sized to handle the type, number and size of equipment conductors to be carried - in compliance with Article 351 of the National Electrical Code.

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

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

DISCRETE LOCAL PRESSURE CONTROL

Separate from the control logic and where remote control/input via telemetry is interrupted or local control is switch selected control of the pumps shall be provided by bellows type, adjustable differential pressure switches. Each switch assembly will be complete with a single pole, double throw contact block with 5 amp non-inductive rated contacts at 230 volts AC. The set points of the on/off cycle shall be independently adjustable through the full range of the switch rating.

1. Start Lead Pump, 4-150 psi control range.
- 1A. Adjustable Differential, 2-25 psi.

A pressure gauge shall be sub-panel mounted adjacent to the discharge pressure switches. The gauge and switches shall be so plumbed with the discharge header sensing line that a common blow off valve can relieve pressure in all simultaneously for purposes of checking and calibrating the start-stop functions of the pumps.

ELECTRICAL DEVICES

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

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

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

Switches, lights and pushbuttons shall be Schneider Electric, Series XB, 22 mm, Die Cast Chrome plated devices. Pilot lights shall be with protected LED's for 120 Vac operation as XB4BVG, pushbuttons shall be non-illuminated, momentary contact, extended lens as ZB4BL and the switches shall be 2 position maintained, 2 position right-to-left, 3 position maintained, 3 position momentary-to-center, 3 position momentary from left to center, and 3 position momentary from right to center with standard black lever as ZB4BD.

Switches

1. Pump #1, 3-position;
2. Exhaust Fan, 2-position;

Lights

1. Red – Low Wet Well Level;
2. Green – Pump #1 in Operation;

The solid state time delay relay shall have an adjustable time range of 10 seconds to 10 minutes. The relays shall be constructed to use a DIN rail mount socket so that the relays can be replaced without disturbing the wiring. The relay shall be complete with LED indicators for output and power.

Time Delay Relays

1. Low Suction Timer

2. Start Control Timer Pump #1
3. Stop Control Timer Pump #1

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

HEATERS

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

EXHAUST FAN

1. One (1) each, installed as shown.
2. Capacity each 230 cfm at .2 inch static pressure.
3. Shaded pole motor - squirrel cage blower.
4. 120 volt A.C. operation from wall mount thermostat and HAND/AUTO switch on main control panel.

END OF SECTION

12-94 HIGH DENSITY POLYETHYLENE PIPE AND FITTINGS

PART 1 – GENERAL

The specification provides minimum requirements for HDPE pipe and fittings to be used in the design and construction of AMD Treatment system.

1.01 DESCRIPTION:

- A. Scope – This section specifies high density polyethylene pipe (HDPE) and fittings for water utility use as indicated on the Drawings, and as specified herein.
- Furnish, Install, and Test HDPE pipe as indicated and specified in this section, and as referred to in related sections, and the Project Drawings.
 - The primary installation method is burial. The means and methods, including the testing for acceptance shall conform to all applicable standards as noted herein with the intention of providing a leak-free system to the owner.
- B. Special Instructions: *None*

1.02 RELATED WORK

- A. The following sections are incorporated by reference:
- a. Section 14-08: Submittals
 - b. Section 14-06: Coordination and meetings
 - c. Section 3-0: Quality Control
 - d. Section 7-07: Testing Pipe Systems

1.03 REFERENCES

- A. To the extent referenced in this specification section, the standards and documents listed below are included, and made a part of this specification.
- B. In the event of a conflict, the requirements of this specification section prevail.
- C. Unless otherwise specified, references to documents shall mean the latest published edition of the referenced document in effect at the bid date of the project.

ANSI/AWWA www.awwa.org

- ANSI/AWWA C901-08 Polyethylene (PE) Pressure Pipe and Tubing, ½ In. (13 mm) Through 3 In. (76 mm) for Water Service
- ANSI/AWWA C906-07 Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) Through 63 In. (1,600 mm), for Water Distribution and Transmission
- ANSI/AWWA C651 Standard for Disinfecting Water Mains
- AWWA M55 Manual of Water Supply Practices, PE Pipe–Design and Installation

Plastics Pipe Institute, PPI www.plasticpipe.org

- PPI Handbook of Polyethylene Pipe – 2009 (2nd Edition)
- PPI TR-33 Generic Butt Fusion Joining Procedure for Polyethylene Gas Pipe
- PPI TR-34 Disinfection of Newly Constructed Polyethylene Water Mains
- PPI TR-41 Generic Saddle Fusion Joining Procedure for Polyethylene Gas Piping
- PPI TN-42 Recommended Minimum Training Guidelines for PE Pipe Butt Fusion Joining Operators for Municipal and Industrial Projects (2009)

ASTM www.astm.org

- ASTM F 714 Standard Specification for Polyethylene (PE) Plastic Pipe (SDR- PR) Based on Outside Diameter
- ASTM F905 Standard Practice for Qualification of Polyethylene Saddle-Fused Joints
- ASTM F 1055 Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing
- ASTM F 1290 Standard Practice for Electrofusion Joining Polyolefin Pipe and Fittings
- ASTM F 1412 Standard Specification for Polyolefin Pipe and Fittings for Corrosive Waste Drainage Systems
- ASTM F1417 Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air
- ASTM F 2164 Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure
- ASTM F2206 Standard Specification for Fabricated Fittings of Butt-Fused Polyethylene (PE) Plastic Pipe, Fittings, Sheet Stock, Plate Stock, or Block Stock
- ASTM D 2239 Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR- PR) Based on Controlled Inside Diameter
- ASTM D 2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
- ASTM F 2620 Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings
- ASTM D 2683 Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing
- ASTM D 2737 Standard Specification for Polyethylene (PE) Plastic Tubing

- ASTM D 2774 Standard Practice for Underground Installation of Thermoplastic Pressure Piping
- ASTM D 3261 Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
- ASTM D 3350-08 Standard Specification for Polyethylene Plastics Pipe and Fittings Materials

1.04 SYSTEM DESIGN PARAMETERS

- A. The *polyethylene* system working pressure rating *accommodates* the normal operating pressure and the repetitive surges. The pressure rating applies at 80°F or less.
- B. Per AWWA 901 and C906, the repetitive surge pressure allowance is one half the pressure class of the pipe, and the occasional surge over pressure allowance is equal to the pressure class of the pipe. Allowable Total Pressure during Recurring Surge conditions equals 1.5 times the pipe's pressure class. Allowable Total Pressure during Occasional Surge conditions equals 2.0 times the pipe's pressure class.

Table 1 gives the Pressure Class per AWWA C901, Pressure Rating and Allowable Total Pressure During Recurring and Occasional Surge for PE4710 pipe at 80°F or less. For PE 3608, refer to Table 2.

Table 1. Pressure Class per AWWA C901 for PE 4710 at 80°F or less

Pipe Dimension Ratio (DR)	Pressure Class	Pressure Rating	Allowable Total Pressure During Recurring Surge	Allowable Total Pressure During Occasional Surge
<i>DR 9</i>	<i>250 psi</i>	<i>250 psi</i>	<i>375 psi</i>	<i>500 psi</i>
<i>DR 11</i>	<i>200 psi</i>	<i>200 psi</i>	<i>300 psi</i>	<i>400 psi</i>
<i>DR 14.3</i>	<i>150 psi</i>	<i>150 psi</i>	<i>225 psi</i>	<i>300 psi</i>
<i>DR 17</i>	<i>125 psi</i>	<i>125 psi</i>	<i>185 psi</i>	<i>250 psi</i>
<i>DR 21</i>	<i>100 psi</i>	<i>100 psi</i>	<i>150 psi</i>	<i>200 psi</i>

Table 2 gives the Pressure Class per AWWA C901 and C906 , Pressure Rating and Allowable Total Pressure During Recurring and Occasional Surge for PE3608 pipe at 80°F or less.

Table 2. Pressure Class per AWWA C901 and C906 for PE 3608 at 80°F or less

Pipe Dimension Ratio (DR)	Pressure Class	Pressure Rating	Allowable Total Pressure During Recurring Surge	Allowable Total Pressure During Occasional Surge
<i>DR 9</i>	<i>200 psi</i>	<i>200 psi</i>	<i>300 psi</i>	<i>400 psi</i>
<i>DR 11</i>	<i>160 psi</i>	<i>160 psi</i>	<i>240 psi</i>	<i>320 psi</i>
<i>DR 14.3</i>	<i>120 psi</i>	<i>120 psi</i>	<i>180 psi</i>	<i>240 psi</i>
<i>DR 17</i>	<i>100 psi</i>	<i>100 psi</i>	<i>150 psi</i>	<i>200 psi</i>
<i>DR 21</i>	<i>80 psi</i>	<i>80 psi</i>	<i>120 psi</i>	<i>160 psi</i>

1.05 SUBMITTALS

A. Quality Assurance / Control Submittals

1. Affirmation that product shipped meets or exceeds the standards set forth in this specification. This shall be in the form of a written document from the manufacturer attesting to the manufacturing process meeting the standards.
2. Manufacturers recommended fusion procedures for the products.

1.06 DELIVERY – STORAGE – HANDLING

- A. Handle the pipe in accordance with the PPI *Handbook of Polyethylene Pipe (2nd Edition)*, Chapter 2 using approved strapping and equipment rated for the loads encountered. Do not use chains, wire rope, forklifts or other methods or equipment that may gouge or damage the pipe or endanger persons or property. Field storage is to be in compliance with AWWA Manual of Practice M55 Chapter 7.
- B. If any gouges, scrapes, or other damage to the pipe results in loss of 10% of the pipe wall thickness, cut out that section *or* do not use.

PART 2 A– PRODUCTS FOR 3 INCH AND SMALLER PIPE PER AWWA C901

2A.01 PIPE

- A. Polyethylene pipe shall be made from a HDPE material having a minimum material designation code of PE 4710 or PE 3608. The material shall meet the requirements of ASTM D 3350 and shall have a minimum cell classification of PE445474C for PE 4710 and PE345464C for PE 3608.

- B. The pipe shall meet the requirements of AWWA C901
- C. HDPE pipe shall be rated for use at a pressure class of 100 psi (DR-17 Minimum). The outside diameter of the pipe shall be based upon the IPS, CTS, or SIDR sizing system.

2A.02 FITTINGS

- A. Butt Fusion Fittings - Fittings shall be made of either PE4710 or PE 3608, with a minimum Cell Classification as noted in 2A.01A. Butt Fusion Fittings shall meet the requirements of ASTM D3261. Molded and fabricated fittings shall have a pressure rating equal to the pipe unless otherwise specified in the plans.

Markings for molded fittings shall comply with the requirements of ASTM D 3261. Fabricated fittings shall be marked in accordance with ASTM F 2206. Socket fittings shall meet ASTM D 2683.

- B. Electrofusion Fittings - Fittings shall be PE4710 or PE 3608, with a minimum Cell Classification as noted in 2A.01A. Electrofusion Fittings shall have a manufacturing standard of ASTM F1055. Fittings shall have a pressure rating equal to the pipe unless otherwise specified on the plans.
- C. Flanges and Mechanical Joint Adapters (MJ Adapters) – Flanges and Mechanical Joint Adapters shall be PE4710 or PE 3608, with a minimum Cell Classification as noted in 2A.01A. Flanged and Mechanical Joint Adapters can be made to ASTM D 3261 or if machined, must meet the requirements of ASTM F 2206. Flanges and MJ Adapters shall have a pressure rating equal to the pipe unless otherwise specified on the plans. Markings for molded or machined flange adapters or MJ Adapters shall be per ASTM D 3261. Fabricated (including machined) flange adapters shall be per ASTM F 2206.

Van-Stone style, metallic (including stainless steel), convoluted or flat-plate, back-up rings and bolt materials shall follow the guidelines of Plastic Pipe Institute Technical Note # 38, and shall have the bolt-holes and bolt-circles conforming to one of these standards: ASME B-16.5 Class 150, ASME B-16.47 Series A Class 150, ASME B-16.1 Class 125, or AWWA C207 Class 150 Series B, D, or E. The back-up ring shall provide a long-term pressure rating equal to or greater than the pressure-class of the pipe with which the flange adapter assembly will be used, and such pressure rating shall be marked on the back-up ring. The back-up ring, bolts, and nuts shall be protected from corrosion by a system such as paint, coal-tar epoxy, galvanization, polyether or polyester fusion bonded epoxy coatings, anodes, or cathodic protection, as specified by the project engineer.

- D. Service connections shall be electrofusion saddles with a brass or stainless steel threaded outlet, electrofusion saddles, sidewall fusion branch saddles, tapping

tees, or mechanical saddles.

For electrofusion saddles with threaded outlet the size of the outlet shall be one inch IPS unless a larger size is shown on the plans. Electrofusion saddles shall be made from materials required in part 2A.02 B. Electrofusion Fittings.

For sidewall fusion saddles, the size of the saddle shall be as indicated on the plans. The saddle can be made in accordance to ASTM D 3261 or ASTM F 2206. After installation, approximately ¼" of the PE pipe shall be visible beyond the saddle to confirm that proper surface preparation occurred. Saddle faces that do not provided ¼ inch of area beyond the saddle are not acceptable.

Tapping tees shall be made to ASTM D3261 or D2683.

Mechanical strap-on saddles can only be used where there use on PE pipe is approved by the mechanical saddle manufacturer. The body of the saddle shall be stainless steel, epoxy coated cast iron or brass. The gasket material and design must be acceptable for PE pipe. The outlet shall be threaded for one inch IPS unless a larger size is shown on the plans. Mechanical strap-on saddles will be installed per the manufacturer's instructions.

2A.03 PIPE AND FITTING IDENTIFICATION

- A. The pipe shall be marked in accordance with the standards to which it is manufactured.
- B. Color identification by the use of stripes on pipe to identify pipe service shall be optional. If used, stripes or colored exterior pipe product shall be blue for potable water.

PART 2 B– PRODUCTS FOR 4 INCH AND LARGER PIPE PER AWWA C906

2B.01 – PIPE

- A. Polyethylene pipe shall be made from HDPE material having a material designation code of PE3608 or higher. The material shall meet the requirements of ASTM D 3350 and shall have a minimum cell classification of PE345464C.
- B. The pipe and fittings shall meet the requirements of AWWA C906.
- C. HDPE pipe shall be rated for use at a pressure class of 100 psi (DR-17 Minimum). The outside diameter of the pipe shall be based upon the IPS or DIPS sizing system.

2B.02 FITTINGS

- A. Butt Fusion Fittings - Fittings shall be made of HDPE material with a minimum material designation code of PE3608 and with a minimum Cell Classification as noted in 2B.01A. Butt Fusion Fittings shall meet the requirements of ASTM D3261. Molded and fabricated fittings shall have a pressure rating equal to the pipe unless otherwise specified on the plans. All fittings shall meet the requirements of AWWA C906.

Markings for molded fittings shall comply with the requirements of ASTM D 3261. Fabricated fittings shall be marked in accordance with ASTM F 2206. Socket fittings shall meet ASTM D 2683.

- B. Electrofusion Fittings - Fittings shall be made of HDPE material with a minimum material designation code of PE 3608 and with a minimum Cell Classification as noted in 2B.01A. Electrofusion Fittings shall have a manufacturing standard of ASTM F1055. Fittings shall have a pressure rating equal to the pipe unless otherwise specified on the plans. All electrofusion fittings shall be suitable for use as pressure conduits, and have nominal burst values of four times the Working Pressure Rating (WPR) of the fitting. Markings shall be according to ASTM F 1055.
- C. Flanges and Mechanical Joint Adapters (MJ Adapters) – Flanges and Mechanical Joint Adapters shall have a material designation code of PE3608 or higher and a minimum Cell Classification as noted in 2B.01A. Flanged and Mechanical Joint Adapters can be made to ASTM D 3261 or if machined, must meet the requirements of ASTM F 2206. Flanges and MJ Adapters shall have a pressure rating equal to the pipe unless otherwise specified on the plans. Markings for molded or machined flange adapters or MJ Adapters shall be per ASTM D 3261. Fabricated (including machined) flange adapters shall be per ASTM F 2206.

Van-Stone style, metallic (including stainless steel), convoluted or flat-plate, back-up rings and bolt materials shall follow the guidelines of Plastic Pipe Institute Technical Note # 38, and shall have the bolt-holes and bolt-circles conforming to one of these standards: ASME B-16.5 Class 150, ASME B-16.47 Series A Class 150, ASME B-16.1 Class 125, or AWWA C207 Class 150 Series B, D, or E. The back-up ring shall provide a long-term pressure rating equal to or greater than the pressure-class of the pipe with which the flange adapter assembly will be used, and such pressure rating shall be marked on the back-up ring. The back-up ring, bolts, and nuts shall be protected from corrosion by a system such as paint, coal-tar epoxy, galvanization, polyether or polyester fusion bonded epoxy coatings, anodes, or cathodic protection, as approved by the WVDEP.

- D. Service connections shall be electrofusion saddles with a brass or stainless steel threaded outlet, electrofusion saddles, sidewall fusion branch saddles, tapping tees, or mechanical saddles.

For electrofusion saddles with threaded outlet the size of the outlet shall be one inch IPS unless a larger size is shown on the plans. Electrofusion saddles shall be made

from materials required in part B. Electrofusion Fittings.

For sidewall fusion saddles the size of the saddle shall be as indicated on the plans. The saddle can be made in accordance to ASTM D 3261 or ASTM F 2206. After installation, approximately ¼" of the PE pipe shall be visible beyond the saddle to confirm that proper surface preparation occurred. Saddle faces that do not provided ¼ inch of area beyond the saddle are not acceptable.

Tapping tees shall be made to ASTM D3261 or D2683.

Mechanical strap-on saddles can only be used where there use on PE pipe is approved by the mechanical saddle manufacturer. The body of the saddle shall be stainless steel, epoxy coated cast iron or brass. The gasket material and design must be acceptable for PE pipe. The outlet shall be threaded for one inch IPS unless a larger size is shown on the plans. Mechanical strap-on saddles will be installed per the manufacturer's instructions.

2B.03 PIPE AND FITTING IDENTIFICATION

- A. The pipe shall be marked in accordance with the standards to which it is manufactured.
- B. Color identification by the use of stripes on pipe to identify pipe service shall be optional. If used, stripes or colored exterior pipe product shall be blue for potable water, or green for wastewater/sewage, or purple (lavender) for reclaimed water.

PART 3 – EXECUTION

3.01 JOINING METHODS

- A. Butt Fusion: The pipe shall be joined by the butt fusion procedure outlined in ASTM F 2620 or PPI TR-33. All fusion joints shall be made in compliance with the pipe or fitting manufacturer's recommendations. Fusion joints shall be made by qualified fusion technicians per PPI TN-42.
- B. Saddle fusion: Saddle fusion shall be done in accordance with ASTM F 2620 or TR-41 or the fitting manufacturer's recommendations and PPI TR-41. Saddle fusion joints shall be made by qualified fusion technicians. Qualification of the fusion technician shall be demonstrated by evidence of fusion training within the past year on the equipment to be utilized on this project.
- C. Socket Fusion: Molded socket fusion fittings are only to be used for joining of HDPE pipe from 1/2 inch to 2" in size. Socket fusion shall be done in accordance with ASTM F 2620 or the fitting manufacturer's recommendations. Socket fusion is the process of fusing pipe to pipe, or pipe to fitting by the use of a male and female end that are heated simultaneously, and pressed together so the outside

wall of the male end is fused to the inside wall of the female end. Qualification of the fusion technician shall be demonstrated by evidence of socket fusion training within the past year on the equipment to be utilized on this project.

- D. Electrofusion: Electrofusion joining shall be done in accordance with the manufacturers recommended procedure. Other sources of electrofusion joining information are ASTM F 1290 and PPI TN 34. The process of electrofusion requires an electric source , a transformer, commonly called an electrofusion box that has wire leads, a method to read electronically (by laser)or otherwise input the barcode of the fitting, and a fitting that is compatible with the type of electrofusion box used. The electrofusion box must be capable of reading and storing the input parameters and the fusion results for later download to a record file. Qualification of the fusion technician shall be demonstrated by evidence of electrofusion training within the past year on the equipment to be utilized for this project.
- E. Mechanical:
1. Mechanical connection of HDPE to auxiliary equipment such as valves, pumps, and fittings shall use mechanical joint adapters and other devices in conformance with the PPI Handbook of Polyethylene Pipe, Chapter 9 and AWWA Manual of Practice M55, Chapter 6.
 2. Mechanical connections on small pipe under 3” are available to connect HDPE pipe to other HDPE pipe, or a fittings, or to a transition to another material. The use of stab-fit style couplings is allowed, along with the use of metallic couplings of brass and other materials. All mechanical and compression fittings shall be recommended by the manufacturer for potable water use. When a compression type or mechanical type of coupling is used, the use of a rigid tubular insert stiffener inside the end of the pipe is recommended.
 3. Mechanical couplings that wrap around the pipe and act as saddles are made by several manufacturers specifically for HDPE pipe. All such saddles, tapping saddles, couplings, clamps etc. shall be recommended by the manufacturer as being designed for use with HDPE pipe at the pressure class listed in this section.
 4. Unless specified by the fitting manufacturer, a restraint harness or concrete anchor is recommended with mechanical couplings to prevent pullout.
 5. Mechanical coupling shall be made by qualified technicians. Qualification of the field technician shall be demonstrated by evidence of mechanical coupling training within the past year. This training shall be on the equipment and pipe components to be utilized for this project.

18.0 LIME SYSTEM EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. General provisions of the Contract, including the Agreement and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. The work covered by this section shall consist of providing all labor, materials and equipment to furnish and install one (1) complete lime slurry system for receiving, storage, mixing and feeding 35-40% HDLCH (High Density Liquid Calcium Hydroxide) slurry as specified herein and as shown on the drawings. The system shall be factory assembled, piped and wired as a complete package prior to shipping. Any component exceeding shipping restrictions may be shipped loose and field installed.
- B. The system includes Lime Hydrate Storage Silo, Bin Activator, Lime Feeder, Slurry Tank and Mixer, Slurry Pumps and Delivery System, complete electrical controls and instrumentation, as described herein.
- C. All Lime System electrical equipment, except eyewash water heaters, shall be powered from the panels provided by the equipment manufacturer. External power cables shall be provided by the Contractor.
- D. The lime system supplier shall be responsible for the design and performance of the lime system and all its components. If the system, or any major component of it, is covered by U.S. Patent or Patents, and the manufacturer requires licensing of the equipment, the system supplier shall provide a License Agreement to the Owner at no additional charge.
- E. One System Supplier shall be responsible for furnishing the equipment of this Section and for coordination of design, assembly, testing, and installation.

1.3 CODES

- A. The WORK of this Section shall comply with the current editions of the following codes:
 - 1. Uniform Building Code (IBC)
 - 2. National Electrical Code (NEC)
 - 3. NFPA (National Fire Protection Association)
 - 4. OSHA, Life-Safety
- B. The lime system and all supporting and ancillary structures shall be designed to include the following parameters: Occupancy Category: III, I: 1.25, Soil Site Class: D, Ss: 0.440, and S1: 0.140, and for items outdoors, wind load of 90 mph, I: 1.15, and Exposure: C. Design concentration roof load is 300 lbs. and roof uniform live load (snow) is 30 psf.

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
1. Commercial Standards:
 - ASTM A 36 - Specification for Structural Steel
 - ASTM A 283 - Specification for Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes and Bars
 - AISI 8620 - Alloy Steel, Hot Rolled and Cold Finished
 - AWS D1.1 - Structural Welding Code – Steel
 - ASTM A48 - Iron Castings
 - SSPC-SP No. 6 - Commercial Blast Cleaning
 - SSPC-SP No. 10 - Near-White Metal Blast
 - ANSI/ASME B20.1 - Safety Standards for Conveyors and Related Equipment
 2. System Supplier's Standards:
 - a. Conveyor Equipment System Suppliers Association (CEMA) standards
 - b. American Gear System Suppliers Association (AGMA) standards
 - c. Institute of Electrical and Electronics Engineers (IEEE) standards
 - d. National Electrical Manufacturers Association (NEMA)
 3. The following service factors shall be applied:

a. Pumps	1.5
b. Compressors	2.0
c. Mixers	1.25
 4. Bearings, unless otherwise noted or required, shall have a minimum L-10 of 5 years or 20,000 hours. Continuous service equipment units (pumps, mixers, etc.) shall have a bearing life of 60,000 hours (L-10).

1.5 SYSTEM DESCRIPTION

- A. Service Conditions
1. The lime feed systems shall be suitable for use in potable water treatment and designed to handle hydrated lime in conformance to AWWA B202. The lime silos will receive hydrated lime in bulk from self-unloading trucks equipped with pneumatic conveying equipment.
 2. The lime slurry tanks and feed system will be installed beneath the silo lime storage compartment as an integral part of the lime system. The silo will be free-standing, self-supporting and located outdoors.
 3. Water supply service to the lime slurry tank will be at 50° F to 65° F temperature.
- B. Sizing Criteria
1. Process Flow: The AMD treatment plant consists of a mixer, clarifier, and final pond with aggregate filter. The system flows vary from 5 GPM to 600 GPM, with a typical rate of 200 GPM. The system capacity is 6.0 MGD with both primaries in operation.
 2. Lime Dose: design Ca(OH)_2 dose is 0.9 g/L, with a range of 0.23 g/L to 1.13 g/L across the entire range of flows.
 3. The lime system maximum capacity is feeding 1,300 lbs/hr of hydrated lime to both primaries together.
 4. The lime system shall be capable of feeding lime at design dose at minimum flow through design dose at maximum flow.

5. The lime system (silo, lime feeder, slurry tank, and slurry pump) will have the ability to dose separate AMD sources at the same time.

1.6 SUBMITTALS

A. Submit for approval:

1. Submit Product Data to completely describe all proposed products, components, materials of construction, and accessories as to manufacturer, model, function, materials of construction, and installation and operation requirements.
2. Submit details of all components, accessories, layout dimension clearances for installation, operation, and maintenance. Include clear illustrations of NEC required clearances.
3. System process and instrumentation drawings illustrating, at a minimum, equipment items, instrumentation, controls, valves, PLC interfaces, piping (size and materials), flow directions, and clear delineation of items supplied by the system supplier.
4. Details of electrical grounding connections.
5. System with dimensioned locations of all anchors and details of each anchor showing, at a minimum, anchor type, diameter, length, and embedment. Plan shall indicate design foundation loads.
6. Dimensioned system general arrangement drawing illustrating lime storage, lime slurry tank, pumping equipment, and mezzanine, and stair tower, platforms and ladders.
7. Dimensioned lime distribution piping system layout drawing.
8. Lime storage volume calculations.
9. Equipment list including capacities, sizes, parts nomenclature, and materials of construction (including capacity calculations).
10. Detailed electrical wiring diagrams for power, instrumentation, controls, panel arrangement drawings, P&ID drawing for the entire system, drive and motor sizes and specifications.
11. Detailed, dimensioned, panel arrangement drawings.
12. Manufacturer's product data sheets for each component, including catalog cat sheets.

B. Within 30 days of Drawing approval, submit:

1. Ladder Logic for control of the lime system.
2. Submit a tags list (registers / data tables) for SCADA interface, listing the tag name (if applicable), I/O address, and I/O description for Submittal Review.
3. All anchors and anchors layout.
4. Sheet metal templates for the precise and accurate installation of cast-in anchors.
5. Detailed system installation manual (erection, adjustments, inspections, and testing).
6. Structural calculations for lime equipment and support structures sealed by a Registered Professional Engineer, licensed in the State of Missouri, for the record.
7. Recommended spare parts list with current pricing

C. Submit with the equipment:

1. Operations and Maintenance Manual including, at a minimum:
 - a. Complete system operating instructions
 - b. A complete, written control narrative, defining the functions and operating sequences and interlocks for all instruments, automated valves, analytical devices, and programmable logic controllers.
 - c. Troubleshooting guide
 - d. System supplier contact information (names, telephone, and fax numbers).
 - e. Recommended preventive maintenance program with schedule

f. Safety guide specific to this installation

D. Submit after acceptance of the system:

1. Documentation of system programming, on paper print-out and CD.
2. Certificate of Proper Installation and inspection, start-up, and acceptance test reports.

1.7 SERVICES OF SYSTEM SUPPLIER

- A. An authorized service representative of the System Supplier shall visit the site and provide the following services. A minimum of two (2) trips and eight (8) days of field service shall be provided as described herein.
1. Assistance with installation of the equipment: one (1) day.
 2. Inspection, checking, and adjusting the equipment: one (1) day.
 3. Startup and field testing for proper operation: four (4) days.
 4. Approximately 12 months after start-up, an additional field service trip consisting of two (2) days on-site shall be provided to inspect the equipment and provide additional training.
- B. The authorized service representative shall also furnish training and instruction of the Owner's personnel in the operation and maintenance of the equipment including step-by-step troubleshooting procedures with necessary test equipment for not less than two (2) days. Times indicated above are excluding travel time.
- C. The system supplier shall provide data sheets for the collection of data during the performance test (see Section 14-16).

1.8 QUALITY ASSURANCE

- A. The lime system and all related controls described in this section shall be the product of a single System Supplier qualified and experienced in the production of similar equipment. Manufacturers must have at least 10 years experience and at least 10 (ten) systems of like HDLCH, High Density Liquid Calcium Hydroxide in 37.5% slurry design. Alternate designs will not be considered. **INSTALLATIONS FEEDING LIME DENSITIES OF LESS THAN 33% WILL NOT BE CONSIDERED ACCEPTABLE EXPERIENCE.**
- B. The Lime System supplier will be responsible for the design and performance of the system and all components, including the lime distribution piping system.

1.9 REGULATORY REQUIREMENTS

- A. All equipment furnished under this division shall meet the requirements of the Federal Occupation Safety and Health Act of 1970 (OSHA) latest edition.
- B. The equipment, as designed and properly maintained shall prevent the release of exhaust air from the silo with particulate substances exceeding 0.15 grains per cubic meter for a normal truck unloading rate of 550 ACFM and an empty tank blow out rate of 1250 ACFM.

1.10 SPARE PARTS

- A. Furnish a complete set of spare parts according to the Standard Spare Parts List provided by the system supplier. Furnish any special tools required for system operation or maintenance.

1.11 WARRANTY

- A. Provide system supplier's standard one-year warranty against defects in materials and workmanship. Any such defects discovered and reported within the warranty period shall be repaired or replaced at no cost to the Owner. "Incidental" charges for warranty service such as shipping or travel are not acceptable.
- B. Provide a system supplier's special one-year performance warranty in which the system supplier guarantees the lime system will produce the design slurry concentration and deliver the design slurry flow to each feed point when operated under design conditions and per the system supplier's written instructions. The system supplier shall further warrant the slurry will be non-settling, non-scaling when operated per supplier's written instructions. The system supplier agrees to repair, modify, or replace equipment and correct, alter, or change the process to enable it to produce the design results at no cost to the Owner. Charges for labor, shipping, travel etc., associated with warranty service are not acceptable.
- C. The Warranty Period shall begin immediately after the successful completion of the Performance Test described in Section 14-16 of this specification .

PART 2 - PRODUCTS

2.1 BASIS OF DESIGN

- A. Subject to compliance with requirements, provide products by one of the following:
 1. Base Bid: CONSECO Division of MERRICK Industries, Lynn Haven, Florida.
 2. Alternates: Others as approved in accordance with the Division 00 and Division 01 requirements.
- B. Design Criteria:

Hydrated lime	AWWA B-202 standard
Average bulk density	25 lb/cf (for silo volumetric design)
Average bulk density	40 lb/cf (for silo structural design)
Slurry Concentration	35% - 40%
Minimum usable storage capacity	5200 Cu. Ft. (each silo)
Wind Load	See paragraph 1.3
Uniform Roof live Load (snow)	See paragraph 1.3
Seismic	See paragraph 1.3
Diameter (maximum)	14 ft
Height to eve (maximum)	60 ft
- C. The HDLCH System shall be designed to receive granular lime hydrate delivered by bulk pneumatic trucks and shall store the lime in the new Storage Silo. The systems shall discharge the lime at a controlled rate without bridging, clogging or flooding of the Slurry Tanks. The HDLCH System shall control the addition of lime and water in order to provide a hydrated lime slurry at concentration and quantity specified in paragraph 1.5 B. The Slurry Tanks shall store the hydrated lime slurry for pumping by the lime slurry pumps.
- D. The Bulk Lime Hydrate Storage Silo shall be designed to store the volume of lime hydrate as specified. The System Supplier shall demonstrate by submission of calculations that the silo

meets the required capacity.

- E. The Slurry Tank shall provide sufficient capacity for safe operation at maximum projected lime delivery rates specified in paragraph 1.5 B. The System Supplier shall demonstrate by submission of calculations that the slurry tanks meet the required capacity.
- F. The Slurry Pump and Delivery System shall dose lime slurry to the process points at the rates as described in paragraph 1.5. B.
- G. The lime system shall provide for dust-free operation.

2.2 EQUIPMENT SCHEDULE

- A. Subject to compliance with the sizing criteria in Paragraph 1.5.B, provide the following:
 - 1. The storage silo shall be welded steel, skirted bulk lime silo designed in accord with EPA clean air standards, BOCA, ASTM, NEC, and NEMA standards.
 - 2. The silo shall be designed to provide two completely enclosed compartments, an upper compartment for hydrated lime storage, a lower compartment for housing the conical bottom section, bin activator, feeder, HDLCH slurry make up tank, feed pumps, controls, and valves. The silo shall conform to ASTM 36 construction, it shall be welded of mild steel plate with interior and exterior welds ground smooth, free of weld spatter prior to sandblast and prime. The plate thickness shall be determined by the manufacturer, as required for the storage capacity, size, material density, and seismic zone but shall be submitted for structural review prior to fabrication. The bottom of the silo shall be attached to the foundation on which it will rest. It shall also include grounding lugs per NFPA 780. Grounding rods and connections shall be provided by the installation Contractor.
 - 3. All material, general design, design loads, allowable stresses, joint design, shop fabrication, and field erection shall be in accordance with all the latest applicable local, state, or federal standards, codes, governing this type of construction. All welds shall provide dust and moisture tight joints. At the time shop drawings are submitted, the contractor shall submit to the Engineer a copy of the design for the silo and structural supports. Field welding when required shall be performed by a certified welder.
- B. Silo Accessories
 - 1. Lower equipment compartment:
 - a. Aluminum access doors in the skirt shall be located as shown on the drawings. The compartment door shall be 3' - 0" wide × 6' - 8" high double access type with hardware and locking device.
 - b. Four (4) 100 watt incandescent vapor - tight lights
 - c. Dual socket 115 v utility outlet GFI type
 - d. 1600 cfm exhaust fan with thermostat control. The exhaust fan shall be located near the top of the compartment area
 - e. Automatic gravity type wall louver sized for exhaust fan and located near the floor of the compartment area.
 - f. 15 KW heater with thermostat control
 - g. Insulated walls with 1-inch thick Aerocel insulation
 - h. Insulate under floor with spray on polyurethane foam
 - j. 2" Back flow preventer for each silo – reduced pressure zone (RPZ) type
 - k. 6" floor drain for slurry tank overflow
 - l. Electric tepid water heater and eye-washing station in each silo, with flow rate capacity and flow duration complying with ANSI Z-358.1 2004 requirements

m. Silo mounting shall be the Stirrup type mounting.

C. Roof

1. The top of the silo shall be equipped with a toeboard and 1-1/4" aluminum handrailing around the silo periphery.
2. The silo roof must be provided with a 24" square manhole with an integral eight inch pressure/vacuum relief valve and a 34" × 54" square filter flange. The silo shall have one set of (4) lifting lugs.
3. Silo roof shall be coated with a non-skid surface.
4. Weatherproof dual 115V GFI utility outlet on roof

D. Access Ladder

1. Provide one access ladder. The single ladder shall provide an access to the silo roof by means of a bridge equipped with handrails and kickboards.
2. Access ladder with rest platforms and safety cages, shall be provided on the side of the silo. Ladder and cage shall be of 6061-T6 aluminum construction. All ladders, rest platforms, cages, railings and toeboards shall conform to the requirements of the federal occupational safety & health act of 1970.
4. The ladder cage will support an RF (SCADA) antenna (provided and installed by others) as shown on Drawings M-02 and M-04.
5. Support brackets for fill pipe and conduits shall be factory installed. All fasteners shall be Stainless steel.

E. Lightning Protection

1. Provide a lightning protection system in accordance with UL96A and NFPA 780 2008 edition of Lightning Protection Systems. The System will not be required to be site specific certified.
2. The Conductors shall be copper, sized as required and shall provide a path from each air terminal horizontally or downward to the connection to the ground rod terminals. Other materials shall be bronze or bronze-copper and listed for intended use. The contractor shall be responsible for providing and installing the down conductors.
3. Ground electrodes or grounding grid shall be provided and installed by the field contractor. Depending on site conditions there shall be at least one 5/8" × 120" buried ground electrode for each down conductor. The connection shall be via exothermic weld.

F. Level Switches

1. The silo shall be provided with (3) motor operated paddle-type level switches. High, High-High, and Low shall be mounted near the access ladder or landing platform in the straight wall for ease of service.
2. The level switches shall be interconnected to the truck unloading panel and the low level shall also be connected to the Operator Control Panel.

2.3 PNEUMATIC TRUCK UNLOADING SYSTEM

A. Fill line

1. A pneumatic truck unloading system shall be included with the storage silo and shall be complete with a 4-inch Sch. 40 black steel fill pipe, pipe supports, long radius wearback 90-degree elbow, compression couplings, quick disconnect with position proof switch, and dust cap. The fill pipe shall terminate approximately 4 feet above the base of the silo. A 14-inch diameter target box with 4-inch Sch. 40 black steel pipe inlet stub,

6-inch diameter clean-out opening and flange gasket shall be provided. The target box and fill pipe shall be shipped loose. The fill pipe and pipe supports shall be prepared and painted in like manner as the silo.

B. Dust filter

1. The silo shall be equipped with a minimum 1250 cfm capacity bag-type dust filter mounted on the silo roof and designed to exhaust the conveying air while the silo is being filled. The dust filter shall be completely shop assembled and include filter bags, shaking mechanism, roof-mounted fan and drive, side access doors, and duct work from collector to fan. The dust filter shall be furnished with sufficient filter bags giving a total cloth area of 375 sq.ft. The dust filter shall be equipped with a 5 hp, 460 volt, 3 phase, 60 hertz, TEFC blower motor complete with damper assembly and bird and weatherproof exhaust hood. The bags are to be mechanically shaken by a 1/4 hp, 1800 rpm, 460 V, TEFC shaker motor.

C. Truck unloading and fill control panel

1. The truck fill control panel shall consist of the following:
 - a. A Nema 4 enclosure mounted firmly on the silo near the termination point of the lime silo fill pipe. All operators shall be Nema 4
 - b. A power on-off selector switch, Key operated
 - c. An auto-off-manual selector for Dust filter fan
 - d. An auto-off-manual selector for Dust filter shaker
 - e. Push button Alarm silence
 - f. Indicating lights for:
 - 1) Power "On"
 - 2) Dust filter fan "On"
 - 3) Dust filter shaker "On"
 - 4) Bin level "High"
 - g. An alarm horn mounted on the panel face.
 - h. Motor starters to be provided within the lime silo control panel

D. Function

1. The Pneumatic truck unloading panel shall be prewired to function as follows:
 - a. With the dust filter fan and shaker selectors in the "auto" position the fan will start when the cap is removed by a limit switch on the end of the fill pipe. The fan shall run and the shaker shall be held off until the truck hose is disconnected and the cap is replaced.
 - b. When the truck hose is disconnected, the limit switch shall deactivate thus initiating shutdown sequence. The fan will continue to run 3 minutes before stopping. After the fan stops the dust filter shaker starts. The shaker running time shall be controlled by an adjustable timer.
 - c. If material in the bin reaches the high level indicator the "high" level light shall come on and the alarm horn shall sound.

E. Assembly

1. The truck fill panel ships detached from the lime station. The silo manufacturer shall be responsible for furnishing prefabricated mounting brackets for mounting the truck fill control panel on the silo near the end of the lime fill pipe. All wiring for the panel shall be completed by the silo manufacturer. Field wiring for remote items between the junction boxes and the panel shall be by the installing contractor.

2.4 LIME FEED SYSTEM

- A. Bin activator
1. To assure uniform density and flow, a minimum 8-ft diameter bin activator constructed of carbon steel shall be connected to the silo discharge cone. The bin activator shall have a 3 hp, TEFC, 460 V - 3 ph - 60 Hz vibrator motor. Forged vibration isolator hangers, and integral baffle, mounting ring, hanger brackets, nordel beaded flexible sleeve with clamp retainer, 304 SS clamps, 3/16-inch wire clamping beads for the bin activator and mounting ring shall be included. Bin activator shall come complete with 10-inch diameter flanged outlet and maintenance type manually operated 10-inch diameter slide gate. The bin activator assembly shall be shipped premounted and wired.
- B. Shut off Gate Valve and Operator
1. Provide a vortex clear action stainless steel knife gate with manual operator. The operator shall include a chain wheel with enough chain to reach within 4' of the floor. The valve shall connect directly to the bin activator discharge.
 2. An air compressor and receiver shall be located near the valve operator. The system shall be designed and sized by the manufacturer to provide sufficient air volume and pressure for quick opening and closing of the valve. The control shall be integrated into the batching operation of the make down system.
- C. Lime feeder
1. The volumetric feeder shall be constructed with stainless steel housing, and a stainless steel helix and spout terminating above the slurry mix tank inlet and connected by a dust tight drop pipe. The feed screw shall be driven by a minimum of 1/2hp, DC, TEFC, variable speed motor, through oil lubricated gear reduction unit. The feeder shall start and stop from the plant run switch but shall operate automatically to batch the lime to the slurry tank as determined by the level sensors, pump feed rates in proportion to the make up water to maintain a 37.5% or operator selected concentration.
- D. Slurry tank
1. The lime feeder shall be mounted adjacent to a slurry mix tank of 500-gallons or larger. The slurry tank shall be designed to maintain a 37.5% slurry concentration (or concentration selected by the operator) regardless of withdrawal rates. It shall be fabricated of reinforced heavy gauge epoxy coated carbon steel with bolted and gasketed cover. It shall include an access door, Ultrasonic level monitor, vent, and breather assembly, and a 1-1/2 hp flanged mounted, 460 V, 3-phase TEFC, Mixer, with stainless steel shafts and dual propellers.
- E. Fittings
1. Threaded connections shall be provided for 3-inch make-up water, 2-inch overflow, two, 2-inch slurry discharge, 4-inch drain, and piped as shown on the plans. A brass solenoid with 120 VAC coil shall be connected to the control panel to start and stop the make-up water. The water manifold shall include an inlet strainer, flow meter with programmable controller, 4-20ma output and a throttling control valve to adjust the water/slurry concentration.
- F. Ultrasonic Control
1. A Nema 4 ultrasonic level control shall provide Hi and Lo level alarms, operating levels, and 4-20ma output signal proportional to slurry tank levels to the system Logic controller.

operation.

3.7 PERFORMANCE TEST

- A. The Lime Slurrying System shall be capable of running, fully automatic, and maintain a constant slurry concentration of a set point in the range 37.5% within 1% set point slurry concentration. The system shall be tested over a three (3) day period and shall meet the following criteria:
 - 1. The Lime Slurry System shall be run for 72 continuous hours without any adjustments made by operating personnel.
 - 2. During the 72 hours test, the final slurry concentration shall be within + or - 1% point of the set point.
- B. During the 72-hour performance test, samples shall be taken from each lime slurry feed point every 6 (six) hours. The samples shall be tested by the plant laboratory, for total solids concentration. All samples shall comply with the requirements listed herein.
- C. In the event the testing does not demonstrate acceptable performance, the Contractor shall be allowed to make revisions to the equipment and perform additional tests, at the Contractor's expense, until acceptable performance is verified.

4.0 METHOD OF MEASUREMENT

The method of measurement for determining the quantity of Lime System as described above is to be included in the lump sum bid price for **Acid Mine Drainage Treatment Facility**, including furnishing all materials and doing all the work prescribed in a workmanlike and acceptable manner, including all labor, tools, equipment, supplies, and incidentals & appurtenances necessary to complete the work as shown on the Contract Drawings.

4.1 BASIS OF PAYMENT

The quantity of the Lime System completed will be paid at the contract lump sum price bid for **Acid Mine Drainage Treatment Facility**. No deduction will be made nor will any increase be made in the lump sum "Acid Mine Treatment Facility" item amount regardless of decreases or increases in the final total contract amount or for any other cause.

4.2 PAY ITEM

"Acid Mine Treatment Facility", per lump sum.

END OF SECTION

ADDENDUM ACKNOWLEDGEMENT FORM
SOLICITATION NO.: DEP16124

Instructions: Please acknowledge receipt of all addenda issued with this solicitation by completing this addendum acknowledgment form. Check the box next to each addendum received and sign below. Failure to acknowledge addenda may result in bid disqualification.

Acknowledgment: I hereby acknowledge receipt of the following addenda and have made the necessary revisions to my proposal, plans and/or specification, etc.

Addendum Numbers Received:

(Check the box next to each addendum received)

- | | |
|---|--|
| <input type="checkbox"/> Addendum No. 1 | <input type="checkbox"/> Addendum No. 6 |
| <input type="checkbox"/> Addendum No. 2 | <input type="checkbox"/> Addendum No. 7 |
| <input type="checkbox"/> Addendum No. 3 | <input type="checkbox"/> Addendum No. 8 |
| <input type="checkbox"/> Addendum No. 4 | <input type="checkbox"/> Addendum No. 9 |
| <input type="checkbox"/> Addendum No. 5 | <input type="checkbox"/> Addendum No. 10 |

I understand that failure to confirm the receipt of addenda may be cause for rejection of this bid. I further understand that any verbal representation made or assumed to be made during any oral discussion held between Vendor's representatives and any state personnel is not binding. Only the information issued in writing and added to the specifications by an official addendum is binding.

Company

Authorized Signature

Date

NOTE: This addendum acknowledgement should be submitted with the bid to expedite document processing.

Revised 6/8/2012