Washington County
MARYLAND

PURCHASING DEPARTMENT
DIVISION OF BUDGET & FINANCE

PUR-1623
ADDENDUM NO. 3
INVITATION TO BID

SMITHSBURG WwTP ENR UPGRADE AND EXPANSION

DATE: Friday, September 8, 2023

BIDS DUE: Wednesday, September 27, 2023
(Revised Due Date - Addendum No. 3) **2:00 P.M.(EDT/EST)**

To Bidders:

This Addendum is hereby made a part of the Contract Documents on which all bids will be based and is issued to correct and clarify the original documents.

Please acknowledge receipt of this Addendum at the appropriate space on the Proposal Form. This Addendum consists of five (5) pages and twelve (12) attachments.

NOTE: All Bidders must enter the Washington County Administration Complex through either the front door at the 100 West Washington Street entrance or through the rear entrance (w/blue canopy roof) which is handicap accessible and must use the elevator to access the Purchasing Department to submit their bid and/or to attend the Pre-Bid Conference. Alternate routes are controlled by a door access system. The general public will be subject to wand search and will be required to remove any unauthorized items from the building prior to entry. Prohibited items include but are not limited to: Weapons of any type; Firearms, ammunition, and explosive devices; Cutting instruments of any type - including knives, scissors, box cutters, work tools, knitting needles, or anything with a cutting edge, etc.; Pepper spray, mace, or any other chemical defense sprays; and Illegal substances.

ITEM NO. 1: All reference in the bid document referencing the Bid Submission Deadline and Bid Opening Time shall be changed to: **No later than 2:00 P.M. (EDT/EST), Wednesday, September 27, 2023**.

ITEM NO. 2: *Inquiry:* I have a question regarding the ductile iron flange specification. Specification section 33 31 00.13 for exterior piping states the ductile iron pipe & fittings are to be cement lined. However, section 40 23 19 does not list a specification for the interior flanged ductile iron pipe. Please provide a specification for the interior ductile iron process piping.

Response: All ductile iron process piping shall be cement lined. Please refer to revised specification 40 23 19 attached to this Addendum.

ITEM NO. 3: *Inquiry:* There is a Spec Section 03 41 13 for Precast Conc Hollow Core Planks, and Section 03 42 00 Precast Struct Conc (which only includes Hollow Core Plank Units)but we cannot locate any on the drawings. Please clarify where these are needed or confirm that they do not apply.

Response: The Precast Hollow Core Planks Specification Section: 03 41 13 applies to the DEOX Baffle Wall in the Pre-Anoxic Tank shown on Sheet PM-1.

ITEM NO. 4: *Inquiry:* Unit Price Bid Item C5 is for 20 LB of Concrete Spalling Repair. There are no details or specs for this work. Please provide a detail & spec for the Concrete Repair, tell us what depth we should base our pricing on, and explain how this is paid by the pound (typically this unit is paid by square foot).

Response: Concrete repairs shall be completed in accordance with the manufacturer's recommendations for the patch repair material. Payment will be based on the amount of material required to make needed repairs.

ITEM NO. 5: *Inquiry:* Are the following forms to be presented with the bid?
00 63 33.10 – Equipment Warranty and Certification forms
00 63 33.13 – Equipment Installation Certification Form
00 63 33.14 – Material and Product Certificate of Compliance

Response: These forms are to be submitted with the shop drawing or O&M Manual submittals as applicable.

ITEM NO. 6: *Inquiry:* Which of the forms listed below gets submitted with the bid and which get submitted by the low bidder.
Attachment I
Disadvantaged Business Enterprise (DBE) Good Faith Efforts Checklist
MDE WIFA 6100 Form

Response: The forms listed need to be submitted with the Bid along with "Assurances for Compliance with Federal Laws, Regulations for Water Quality-Treatment Works and Drinking Water Project". Government Wide Debarment and Suspension, Form of Proposal, Schedule of Prices, Sub-Contractors Listings, Bid Bond, and the Agreement.

ITEM NO. 7: *Inquiry:* If the DBE goals are met, do you still need to submit Good Faith Efforts

Response: Yes.

ITEM NO. 8: *Inquiry:* Please confirm the DBE Goals

Response: Please refer to Page 8, MDE insert.

ITEM NO. 9: *Inquiry:* Please provide a copy of the pre bid attendees that attended the meeting on Monday Aug 14 for the Smithsburg WwTP ENR Upgrade and Expansion PUR-1623 prebid time and date Monday, August 14, 2023 at 10 A.M. (EDT/EST) Washington County Division of Environmental Management 16232 Elliott Parkway

Response: Sign-in sheet from Pre-Bid meeting on 8-14-23 is attached.

ITEM NO. 10: *Inquiry:* Page C-2, Bio-Mag Building notes new pressure sustaining valves for the utility water, bio-mag system, and yard hydrant. However, these valves are not shown on any drawing. Please provide details for these valves.

Response: Pressure sustaining valves are part of the Utility water system and are shown on sheets PM-15 and PM-16.

ITEM NO. 11: *Inquiry:* 44 42 56 – chemical feed systems 2.2 – storage tank – please confirm capacity of tank. Spec calls for 1500 but based on drawing PM-10 It appears to be same size as alum tank (spec'd 2550)

Please confirm material of that tank, named manufacturers are FRP & Polyethylene constructed tanks. Drawing PM10 also shows side access, this is typically done exclusively with FRP constructed tanks. If FRP is an appropriate material of construction would PlasTanks industries be an approved manufacturer for the tanks?

Response: Part 1 of Item No. 10 herein: Micro-C storage tank capacity shall be 1,500 gallon.

Response: Part 2 of Item No. 10 herein: Tank construction to be polyethylene - openings of tank per specification, no side-entry manhole required. Refer to revised specification section 44 42 56 attached to this Addendum.

ITEM NO. 12: *Inquiry:* 2.3 – Micro-C feed pumps – the spec references solenoid diaphragm pumps but lists Watson Marlow (peristaltic). Would Blue-White M3 be acceptable for Micro-C service?

Response: Acceptability of alternative manufacturer will be evaluated during shop drawing review. If internal components are the same material as specified, they should be acceptable.

ITEM NO. 13: *Inquiry:* 2.5/2.6 – pulsation dampeners are called out in the spec but not shown on drawings. Are these required?

Response: Yes, pulsation dampeners shall be provided as specified.

ITEM NO. 14: *Inquiry:* Four function valves are reserved specifically for solenoid driven pumps and not for peristaltic pumps. If the Micro-C & caustic are peristaltic pumps these will not be able to be furnished.

Response: Four (4) function valves are not required. Refer to revised specification 44 42 56 attached to this Addendum.

ITEM NO. 15: *Inquiry:* Please confirm count of pumps: PM-10 shows a duplex system in broken lines future caustic in garage area & chemical room with triplex Micro-C, simplex alum, duplex alum. E-22 show triplex system in garage then in chemical room alum pumps 1-6.

Response: There are a total of seven (7) chemical metering pumps included in this contract and two additional sodium hydroxide pumps shown as future. The metering pumps include: three micro-c metering pumps for the SBR's (two duty and one standby), three alum pumps for the SBR's (two duty and one standby), and one alum metering pump for the post EQ tank.

ITEM NO. 16: *Inquiry:* 43 32 69 – chemical injectors Hayward does not appear to offer quick release coupling. Would SafTFlo be acceptable manufacturer? The SafTFlo EB-163 is largest available size with quick release coupling (3/4" process connection)

Response: Yes, SafTFlo is an acceptable "approved equal".

ITEM NO. 17: *Inquiry:* 44 42 73.31 storage tank Please confirm if the tank is single wall or double wall construction. 2.5.C references transition fittings to allow two tanks to move independently. Is FRP construction acceptable? FRP construction would be able to accommodate the side manway & fitting arrangement shown on drawings.

Response: Alum bulk tank is a single wall and shall be constructed from high density cross-linked polyethylene per the specification. There is only one alum tank in this installation.

SPECIFICATION REVISIONS:

REPLACE Specification Section 40 23 19 Process Piping, Fittings and Specialties in its entirety with revised Specification Section 40 23 19 Process Piping, Fittings and Specialties, attached.

REPLACE Specification Section 40 23 21 Testing Piping Systems in its entirety with Revised Specification Section 40 23 21 Testing Piping Systems, attached. ADD new Specification Section 40 23 36.12 Pipe Hangers and Supports in its entirety, attached.

REPLACE Specification Section 44 42 56 Chemical Feed Systems in its entirety with Revised Specification Section 44 42 56 Chemical Feed Systems, attached.

REPLACE Specification Section 44 42 75 Submersible Influent Pumps in its entirety with Revised Specification Section 44 42 75 Submersible Influent Pumps, attached.

REPLACE Specification Section 44 42 76 Post EQ Pumps in its entirety with Revised Specification Section 44 42 76 Post EQ Pumps, attached.

DRAWING REVISIONS:

REPLACE Drawings C-1, C-2, and C-3 in their entirety with revised Drawings C-1, C-2, and C-3, attached.

REPLACE Drawing S-13 in its entirety with revised Drawing S-13, attached. Drawing PM-6, ADD the following note: "4. CONTRACTOR TO DEWATER TANK AND VERIFY SUCTION ELBOW AND PUMP RAIL DIMENSIONS PRIOR TO SUBMITTING POST EQUALIZATION PUMP SHOP DRAWINGS. SUCTION ELBOW DIMENSIONS TO BE PROVIDED VIA SUBMITTAL."

By Authority of:

Rick F. Curry, CPPO
Director of Purchasing

SECTION 40 23 19

PROCESS PIPING, FITTINGS AND SPECIALTIES

PART 1 GENERAL

1.1 SUMMARY

A. The Contractor shall furnish and install all materials, equipment and appurtenances necessary for the complete and satisfactory installation of all process piping systems within and between structures except as noted, as shown on the drawings and as required for a complete installation as specified herein.

B. Related work included elsewhere:

1. Piping for plumbing and HVAC systems shall be as specified in Divisions 22 and 23 respectively.

1.2 QUALITY ASSURANCE

A. Install piping to meet the requirements of state and local building codes.

B. Materials contaminated with gasoline, lubricating oil, liquid or gaseous fuels, aromatic compounds, paint solvent, paint thinner, or acid solder will be rejected.

B. Certification of Welders

1. All shop and field welding under this contract for stainless steel piping and other piping systems shall be done by experienced welders who are skilled and have experience in the method and materials used. All welders shall be qualified as specified in the ASME Code for Unfired Pressure Vessels, Paragraph U-70.
2. For field welding, the Contractor shall submit to the Engineer for his review and approval a certified statement, from an approved testing agency for each welder he proposes to use for welded piping. Each certified statement shall indicate that the welder has, within six months from proposed employment on this project, been successfully qualified under the requirements of Section IX of the ASME Boiler Construction Code. All certificates and qualifications shall be at the Contractor's expense. The Engineer will return the certified statements to the Contractor for retention on job in the Contractor's field office. Any work installed by an individual who has not been approved by the Engineer shall be removed by the Contractor and shall be replaced with work installed by qualified and approved welders at the Contractor's expense.

1.3 SUBMITTALS

A. Shop Drawings and Product Data

Submit detailed certified dimensional shop drawings and manufacturer's product data for materials and equipment as specified under Section 01 30 00. Show complete information concerning materials of construction, fabrication, protective coatings, installation and anchoring requirements, fasteners and other details. The Contractor shall submit piping layouts for all piping systems for approval by the Engineer.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS SCHEDULE

A. Pipe and fittings shall be as indicated on the drawings and as listed in the schedule included at the end of this section, which schedule is intended to serve as a general guide and is not necessarily a complete

listing of every piping system. Systems which may not be listed shall be comprised of the same kind of pipe and fittings as in similar systems which are listed, or as directed by the Engineer.

2.2 GENERAL NOTES – PIPING

A. It is to be noted that in the relatively small piping systems, the drawings do not necessarily show all fittings, offsets, unions, hangers, supports, etc. All such items shall be furnished and installed, however, as required for complete and satisfactory installation of the equipment shown.

B. Piping for plumbing and HVAC systems is specified in other sections of the specifications. Miscellaneous piping systems which may not be described specifically by any section of these specifications shall be of the type of pipe and fittings as directed by the Engineer or as shown on the drawings.

C. The Contractor shall verify all dimensions of valves, special castings and fittings, pipe equipment, etc., so that all of the pipe work performed will fit together properly and will conform to the arrangement as shown on the drawings. In selecting laying lengths of fittings, the Contractor shall be guided by the dimensions of equipment to which connections are made and by the indicated dimensions on the drawings. All pipe and specials shall be accurate to the dimensions shown. Hubs, spigots, and flanges shall be at right angles to the axis of the opening, and openings shall be at the exact angle specified.

D. All piping shall be pressure and leak tested as specified in accordance with the requirements of Division 40 23 21 Testing Piping Systems. All potable water piping shall be disinfected.

E. All ferrous piping systems shall be coated in accordance with Section 09 90 00.

2.3 GENERAL NOTES – FITTINGS

A. All fittings shall be of the type indicated on the drawings unless otherwise specified. Ferrous piping shall be provided with ferrous fittings; stainless steel piping shall be provided with stainless steel fittings. In general, all fittings shall be as specified hereinafter in paragraph entitled “Pipe and Fittings Schedule”.

B. Nipples shall be extra heavy of same material as piping system in which they are installed. Close nipples are not acceptable.

C. Wherever the sizes of pipes are reduced, the fittings shall be made to suit these changes without the use of bushings.

D. All flanges shall come fairly face to face; the pipe in perfect line, the pipes shall not be sprung to make a joint. Gaskets for flanged joints shall be as specified under “Joints”. All joints shall be neatly made and with great care.

E. Screwed type systems shall contain ample unions in piping at equipment to allow easy removal of the equipment.

F. All piping with flanges shall have stainless steel bolts.

2.4 DUCTILE IRON PIPE AND FITTINGS – CEMENT LINED

A. All ductile iron pipe shall be manufactured in accordance with ANSI A21.51 (AWWA C115) for Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water and Other Liquids.

B. All ductile iron fittings and specials shall be manufactured in accordance with ANSI A21.10 (AWWA C-110) for Gray-Iron and Ductile Iron Fittings, 4” through 48”, for Water and Other Liquids. Sizes 4” through 12” shall be pressure rated for 350 psi water pressure plus water hammer; sizes 14” in diameter and larger shall be pressure rated for 250 psi water pressure plus water hammer.

C. Joints for pipe, fittings and specials shall conform to ANSI A21.11 (AWWA C-110) Specification for Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings. Joints shall be flanged. Pipe shall be Class 53. Fittings 14" and larger shall be rated for minimum 150 psi. Flanges shall be drilled and faced for ANSI Class 125.

D. Pipe and fittings shall be cement lined in with ANSI Specifications A21.4 Section 4-10.1, with curing to be effected by an application of a bituminous seal coating which shall cover and seal the cement mortar. The thickness of the cement lining shall be that specified in Section 4.8.2, Single Thickness.

E. Ductile iron pressure pipe shall be made of ductile iron of good quality and of such character as shall make the metal casings strong, tough and of even grain and soft enough to satisfactorily permit drilling, tapping and cutting. All piping shall be smooth, free from scale, lumps, blisters, and sand holes and defects of every nature which make it unfit for the use intended. All piping shall be straight and shall be true circles in section with its inner and outer surfaces concentric. No plugging, filling, burning-in or welding shall be allowed. All piping shall be subject to inspection and approval by the Engineer upon delivery, and no broken, cracked, misshaped or otherwise damaged or unsatisfactory piping will be accepted.

F. Each piece of pressure ductile iron pipe shall have the weight and class designation conspicuously painted on it as near as possible to flange or bell end of the pipe and these designations shall be clearly legible.

G. Wherever ductile iron pipe is specified or shown as having a spigot end, plain end will be acceptable.

H. Where required or shown, the Contractor shall provide ductile iron specials. Specials shall in general consist of spool pieces, less than standard lengths of flanged, spigot end, or bell end pipe, or combination of ends, and nonstandard fittings. The specials shall conform in material, thickness and finish to the pipe in which they are installed. Taped reinforced bosses shall be provided as an integral part of fittings, when shown or specified.

I. Flanges may be cast integrally with the ductile iron pipe, or screwed on type flanges may be used. Pipe compound of the manufacturer's recommendation shall be used at each threaded joint or flanges.

J. All exposed interior ductile iron pipe, fittings and exposed specials, shall be painted. The Contractor shall furnish pipe and fittings with a shop prime coat of paint. In any case, it shall be the Contractor's responsibility to provide a satisfactory final field finish painting job. Details of painting and materials to be used shall be as specified in Division 09 90 00.

K. Where eccentric reducers are indicated to be used, the reducer shall be installed with its straight side at the top of the piping system.

2.5 STEEL PIPE AND FITTINGS

A. General
   1. Steel pipe and fittings shall be provided in accordance with the "Pipe Schedule". All fitting, flexible couplings and supports shall be provided as shown on the Drawings. All steel pipe and fittings shall be tested in accordance with AWWA C200. Unless otherwise directed by the Engineer in writing, field welding of pipes and fittings will not be permitted.

B. Materials
   1. Pipe and fittings shall be provided by the same manufacturer. Steel pipe shall conform to AWWA C200. Fittings shall conform to AWWA C208. Flanges shall conform to AWWA C207. Steel shall conform to ASTM A53, Type E or S.
   2. All pipe and fittings shall be rated for 150 psi service.

C. Coatings

1. Interior of all pipe and fittings shall be Portland cement mortar lined in accordance with AWWA C205. The exterior of all pipe and fittings shall be primed and finished painted in accordance with Division 9 for metal in interior non-immersion service as appropriate.

2.6 STAINLESS STEEL PIPE AND FITTINGS

A. All pipe and fittings shall be manufactured and fabricated from stainless steel sheets conforming to ASTM A240-72A. The sheet furnish shall have a mill finish. Pipe and fittings shall be designed for minimum 150 psi operating pressure. Pipes, fittings and specials shall have the following minimum wall thicknesses.

Diameter (inches)	Schedule
< 2	40
2-1/2 to 8	5
10 and 12	10
14 to 20	10

Pipes shall be joined using factory welds or mechanical couplings of the type specified in this Section.

1. Fittings – elbows 16 inches and smaller will be smooth flow with radius of 1-1/2 times pipe diameter except where due to space restrictions. Elbows 18 inches and larger will be fabricated from five mitered sections of 90 degree with radius of 1-1/2 times pipe diameter except due to space restrictions.
2. Slip-on flanges shall be rolled angle face rings of 316L stainless steel. The rolled angle face shall be true and perpendicular to the axis of the pipe or fitting.
3. Backing flanges for the flanged joints shall be stainless steel and drilled to ANSI B16.1 Class 125.
4. All bolt holes shall straddle normal horizontal and vertical centerlines of flanges unless otherwise noted on drawings.
5. Gaskets shall be all graphite, Grafoil as manufactured by Crane Packing Company or approved equal. Thickness shall be as recommended by the stainless steel pipe manufacturer. Grafoil gaskets are only required for air piping. All water bearing pipes shall have rubber gaskets suitable for use with sewage. Gaskets shall be American Toruseal, or approved equal, conforming to ANSI/AWWAA C11/A21.11.
6. All interior bolts and nuts shall be stainless steel.

B. Pipe and fittings shall be manufactured in accordance with ASTM A778-80 and A774-80, respectively.

C. All fabrication and welding shall be performed in the shop by certified welders to ASME approved procedure and ASW Standards. Field welding shall only be permitted with approval by the Engineer. All welding shall be by the shielded arc, inert gas, MIG or TIG method. Filler wire shall be added to all welds to provide a cross section of weld metal equal to, or greater than, the parent metal. Inert gas shielding shall be provided to the interior and exterior of the joint. Interior weld beads shall be smooth, even, and not have an interior projection more than 1/6 inch beyond the I.D. of the pipe or fitting.

D. After manufacture all pipe, fittings, supports, specials, etc. shall be passivated by immersion in an air agitated pickling tank containing a 10% solution of nitric and hydrofluoric acids for 15 minutes. The acid shall be neutralized by immersion in a rinse tank containing clean water and tri-sodium phosphate.

E. After fabrication, all shop welds shall be wire brushed and scrubbed with the pickling solution, neutralized and washed clean.

F. All stainless steel components shall be handled, transported, fabricated and installed taking care not to make contact with ferrous material; as the contamination of stainless steel by steel may lead to marks caused by rusting of imbedded steel.

G. Joints for pipe, fittings and specials shall be as shown on the drawings or as directed by the Engineer. Backing flanges for the flanged joints shall be stainless steel and drilled to ANSI B16.1 Class 125.

H. Each pipe, fitting and fabrication shall have type, gauge and heat number marked and these designations shall be clearly legible.

I. Certification of all plant tests required under the Standard Specification under which the pipe and fittings are furnished, and certification that such results obtained conform to those specifications, shall be submitted to the City, covering all pipe and fittings delivered to the job.

J. The stainless steel piping shall be as manufactured by Felker Bros. Corp., Douglas Bros., a Division of Robert Mitchell Inc., or approved equal.

K. Spool type expansion joints shall be suitable for 10 psig air service with a temperature range of 0°F to 300°F, 25 psig 60°F test pressure. The tube shall be seamless Nordel (EPT) extending through the bore to the outside edge of both flanges. Caracass shall be flexible Nordel (EPT). Cover shall be neoprene, ANSI 16.5. All expansion joints which are exposed to the weather shall be coated externally with Hypalon paint for protection against sunlight and ozone. Mercer Rubber Company Style 2502EP RM Holz, General Rubber, Metra Flex, or approved equal with galvanized steel retaining rings.

2.7 **MECHANICAL COUPLINGS AND EXPANSION JOINTS**

A. Mechanical couplings and expansion joints shall be installed where indicated on the contract drawings and may be used in lieu of flange joints where appropriate and where space allows the easy removal of the coupling.

B. Mechanical coupling shall be provided with the ends as indicated on the drawings. In locations where the coupling is not shown or the type of coupling end is not indicated the Contractor shall submit a schedule for the type of end. ExE shall denote expansion by expansion; FxE shall denote fixed by expansion; and FxF shall denote fixed by fixed.

C. The flexible couplings shall be a hand-built rubber spool type expansion joint as called out on the drawings. Materials of construction shall be Butyl tube reinforced with multiple plies of polyester or Nylon tire cord with a Butyl cover. The body of the expansion joints shall be steel reinforced. Molded type couplings with flanges requiring metal retaining rings are not acceptable. Flexible couplings shall be PROCO Series 230, or approved equal.

D. Coupling Housing – Stainless Steel T316.

E. Gasket EPDM conforming to ASTM D2000 up to 240oF.

F. Bolts and Nuts – Stainless Steel ASTM A276, T304, minimum tensile strength 85,000 psi.

G. Mechanical Coupling Manufacturer: Depend-O-Lok, or approved equal.

2.7 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS (SINGLE WALL)

A. Those piping systems listed in the schedule and where noted on the drawings as being “PVC” shall be unplasticized polyvinyl chloride normal impact type, conforming to ASTM Specifications D-1784 and D-1785 for Class 12454-B. Pipe shall be Schedule 80. Pipe shall be that of the B.F. Goodrich Company, Grinnel Company, Inc., International Pipe and Ceramics Corporation, or approved equal, and each length shall be clearly labeled with the manufacturer’s name, PVC type, schedule and size. Pipe shall be extruded. Welded sets will not be permitted.

B. Fittings shall be PVC normal impact type for use with Schedule 80 pipe and shall be as manufactured by Celanese Piping Systems, Inc., or approved equal. All fittings shall be solid molded. Welded seams shall not be permitted.

C. Generally, all PVC pipe and fittings shall have socket type joints with solvent cement. Joints shall be made in accordance with the manufacturer's instructions. Where specifically noted on the drawings, or where required for connections to equipment for special reasons, pipe and fittings shall have threaded ends, or flanged joints. Threaded joints shall be made using the pipe manufacturer's recommended thread lubricant joint compound. Flanges may be the socket type, and shall be complete with rubber gaskets and stainless steel bolts and nuts.

D. The Contractor shall demonstrate to the full satisfaction of the Engineer that his personnel are adequately skilled in making the joints specified above, prior to installation of any PVC piping.

E. The County reserves the right to direct the Contractor to have tests conducted on PVC pipe and fittings. These tests, if required, shall be conducted at the manufacturer's plant and shall be at the Contractor's expense. Tests shall be sufficiently complete to prove conformance with the requirements of Commercial Standard CS-256-53, and the following additional quality requirements shall be similarly met:
   1. A parallel plate flattening test to the extent that face to face contact of the interior wall surface is made. The formation of cracks shall be considered failure.
   2. Immersion in a mixture of 15% by volume of dimethyl formamide in anhydrous acetone for twenty (20) minutes. The specimen shall exhibit no visible flaking upon completion of the test.
   3. Fittings and couplings shall meet burst pressure requirements of Table 6 of ASTM Specification D1785 for pipe when tested with end plugs inserted to a distance no more than 1/3 of the socket depth.

2.8 FLEXIBLE HOSE

A. Those piping systems listed in the schedule and where noted on the drawings as being "flexible hose" shall be EPDM rubber; wound with fiber cords and flexible steel helix wires. Hose shall be equipped with cam and groove connectors where indicated on the Contract Drawings.

2.9 CPVC DOUBLE WALL PIPING SYSTEM

A. The CPVC double wall piping system shall be a pre-fabricated containment piping system as manufactured by (Guardian Systems, MI) Division of IPEX Industrial, or approved equal. The system shall be designed, fabricated, installed and tested in accordance with manufacturer's recommendations and as specified herein and shall be suitable for the intended service. Manufacturer shall have a minimum of five (5) years experience. Contractor shall not design and or fabricate the piping system.

B. Each contained piping system shall consist of grey Schedule 80 CPVC primary piping system supported within a clear Schedule 40 PVC secondary containment housing. Carrier fitting sizes ½" through 4" will utilize Centra-Lok molded supports minimizing the number of (factory assembled) carrier fitting joints. Each system shall be provided with suitable drains and vents and be designed to provide complete drainage of both the primary and secondary containment piping. Interstitial supporting devices shall be made from Polypropylene Centra-Guide supports and shall be provided within the secondary containment pipe. Supports shall be designed to allow continuous drainage in the annual space to the drain points. Drain fittings shall be designed to allow a valve attachment to be made so that the secondary containment compartment may be readily drained and manually checked for leaks.

C. Materials
   1. The primary pipe and fittings shall be manufactured from Schedule 80 CPVC materials as listed by ASTM and ANSI.
   2. The secondary containment pipe and fittings shall be manufactured from clear Schedule 40 PVC materials as listed by ASTM and ANSI.
   3. All listed primary pipe and containments shall be Schedule 80 materials. Pipe shall have Schedule 80 CPVC pipe thickness. All listed pressure fittings shall be Schedule 80 CPVC according to ASTM D-02467

specifications. All other unlisted components that are intended for use as pressure retaining components shall have sufficient thickness and reinforcement so as to be able to maintain the same pressure ratings as the equivalent Schedule 40 PVC pipe.

4. Interstitial supporting devices used to center and support the primary piping within the secondary containment pipe shall be manufactured from molded Polypropylene Centra-Guide supports, according to ASTM and ANSI.
5. All listed secondary containment pipe and components shall be Schedule 40 materials. Pipe shall have Schedule 40 thickness according to ASTM D-1784. All listed pressure fittings shall be Schedule 40 according to ASTM D-2466. All other unlisted components that are intended for use as pressure retaining components shall have sufficient thickness and reinforcement so as to be able to maintain the same pressure ratings as the equivalent schedule 80 CPVC pipe.
6. All fittings shall be preassembled (1/2" through 4" carrier fittings will be supported w/Contra-Lok System or approved equal, 6" and larger carrier will be supported with manufacturer's standard polypropylene fitting discs), and pre-tested by the manufacturer.

D. Installation
   1. All installation procedures shall be according to the manufacturer's specific recommendations.
   2. Secondary containment joints shall be solvent-cemented joints using an approved PVC cement ASTM D-2564, made in accordance with ASTM D-2855 procedure. The splitting and rewelding of fittings shall not be permitted.
   3. All contractor personnel that will prepare solvent cemented joints shall be qualified for such bonding practices according to the bonding qualification procedure described in ASME B 31.3, Chapter VII for bonding of plastic piping.

E. Cleaning and Testing
   1. Upon completion of the installation, the primary piping system shall be pressure tested at 150% of the system design pressure for a period of one hour. Additionally, the system shall be tested during the installation at intervals to be determined by the manufacturer. All tests shall be done in strict accordance with the recommendations of the manufacturer, including the sequence and duration of such tests.
   2. Upon completion of the installation, the secondary containment piping shall be pneumatically tested at a minimum duration of 2-1/2 hours. The external joints should be soaped and visually inspected for leaks. It is imperative that a working pressure regulator be used during the pneumatic test to insure over pressurization of the PVC, beyond 10 psi cannot occur. Also, all precautions should be taken to protect against the hazards of a possible brittle fracture of PVC under compressed gas. Both the preliminary and final test shall be done in strict accordance with the recommendations of the manufacturer, including sequence and duration of such test.
   3. Following installation of the systems, the primary piping system shall be flushed clean. The contractor shall check the operation of all valves.

F. Spare Parts
   1. Provide two sections of straight pipe, 20 feet in length, each type.
   2. Provide two spares of each type of fitting and specialty device used.

2.10 COPPER

A. Hard Copper Tube: ASTM B 88, Type L (ASTM B 88M, Type B) water tube, drawn temper.
   1. Cast-Copper Solder-Joint Fittings: ASME B16.18, pressure fittings.
   2. Wrought-Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
   3. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
   4. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

B. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.
   1. Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
   2. Copper Pressure-Seal-Joint Fittings:

      a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         1) Elkhart Products Corporation; Industrial Division.
         2) NIBCO INC.
         3) Viega; Plumbing and Heating Systems.
         4) Or Approved Equal.

      b. NPS 2 (DN 50) and Smaller: Wrought-copper fitting with EPDM-rubber O-ring seal in each end.

2.11 JOINTS

A. Joints
   1. All joints at equipment shall conform to the equipment requirements. No direct welded connections shall be made to valves or other equipment. Right and left couplings, long screws, or caulking of pipe threads or gasket joints will not be permitted. Mitered joints for elbows and matching straight runs of pipe for tees or elbows will not be permitted.
   2. Soldered or brazed joints shall be made with solder and a noncorrosive paste flux. The solder mixture shall be of 95-5 (tin-antimony) content. The use of acid core solder shall not be permitted. The application of excess heat shall be avoided to prevent undue softening or burning of the fittings or tubing when making connections. All soldering operations shall be performed in strict accordance with best accepted practices. Tubing shall be square cut and reamed to remove all burrs. The inside of the fittings and the outside of the tubing at each end shall be well cleaned immediately prior to soldering to remove all traces of oxidation, regardless of how clean the surfaces of the pipe and fittings may appear.
   3. Threads shall be standard, clean-cut and tapered. All pipe shall be teamed free from burrs and kept free from scale and dirt. Unless otherwise specified, threaded joints shall be made up with "Permatex" type 2, black, nonhardening pipe joint compound applied to the male thread only. The use of red lead or white lead will not be permitted. The complete threaded joint shall not have more than two threads exposed when made tight. Threads shall comply with ANSI B2.1.
   4. Except where special couplings are indicated, piping requiring screwed connections shall be connected with screwed, malleable iron, ground joint, brass seat, 150 psi unions; for piping requiring flanged connections, flanged malleable iron unions shall be used. The finish of all unions shall match piping in which they are installed. Unions shall be provided at equipment and where required otherwise to facilitate removal of piping or equipment.
   5. All gaskets between flanged connections and fittings shall be rubber ring gaskets 1/8 inch thick.
   6. Flanges shall be of the same material as the piping on which installed, and bolts, nuts and washers shall be of mild steel, with good sound well-fitting threads; the nuts shall be cold punched, hexagonal, trimmed and chamfered. Heads, nuts and threads shall be U.S. Standard sizes. Bolts shall be of such length as to project ¼ inch beyond the nut when the flanged joint with gasket is assembled. All hardware shall be galvanized. For exterior, exposed flanged joints, bolts and nuts shall be of 18-8 stainless steel.
   7. Welded joints, if required in the project, shall be made by the electric arc or oxyacetylene gas process. Only thoroughly experienced certified pipe welders shall be employed for the work. The welding wire used shall be coated heavily and shall be of material suitable for making the best possible pipe welds. After being welded, the piping, when tested as specified hereinafter, shall show no indication of leakage, weakness, and other defects. Welding and welders shall be in accordance with the paragraph entitled "Certification of Welders" specified hereinbefore.

B. Flexible Couplings and Flanged Coupling Adapters for Ductile Iron Pipe

1. Unless specified or shown otherwise on the drawings, flexible couplings shall be the harnessed Dresser Style 38, No. 411 of Rockwell International, or approved equal. Each shall be so harnessed, designed and constructed to withstand an internal line pressure equal to that of the pipeline in which it is to be installed. The various flexible couplings shall be suitable for the class and size of ductile iron pipe or steel pipe as required at the various locations, and shall be without pipe stops. The Contractor shall provide and install flexible couplings in addition to those shown, as required, for flexibility in installing the various piping systems. Locations of additional couplings shall be as directed by the Engineer.
2. Flanged Coupling Adapters shall be used for joining plain-end pipe to flanged valves, fittings and pumps. Mechanical Joint, ANSI A21.11.
3. Harnesses shall be provided across all flexible couplings and all flanged adapters.

C. Hose Couplings
1. Cam-locking quick coupler. MPT socket, FPT adapter plug, side levers. Couplers shall be stainless steel with Buna N gaskets and meet MiL-C-27487 specifications.

D. Grooved Joints
1. The grooved joints shall be formed from stainless steel with self contained O-ring seals in the coupling/fitting ends. The couplings and fittings shall be UL/ULC classified to ANSI/NSF 61 for cold +86° F (+30° C) and hot +180° (+82° C) potable water service. This system shall be rated to a maximum working pressure of 300 psi for water, oil, gas, chemical, air, and vacuum services. Grooved joints shall be Victaulic or approved equal.

E. Dismantling Joints
1. Flange Spool: AWWA Class D flange compatible with ANSI Class 125 and 150 bolt circles. For 3'-12"sizes, pipe is Schedule 40 ASTM A53. For 14'- 24"pipe materials are ASTM A36.
2. Body: ASTM A536 ductile (nodular) iron meeting or exceeding Grade 65-45-12 with ANSI Class 125 and 150 bolt circles.
3. Gaskets: ASTM D 2000.
4. Restraining Bolts: 7/8 -9 roll thread, ductile (nodular) iron, meeting or exceeding ASTM A536.
5. Restraining Lugs: Ductile (nodular) iron, meeting or exceeding ASTM A536.
6. Lug Locators: Polyurethane, a thermal plastic.
7. T-bolts and Nuts: High strength low alloy steel T-head bolt. National coarse rolled thread and heavy hex nut. Steel meets AWWA C111 composition specifications.
8. Coatings: Fusion bonded epoxy, NSF 61 certified.
9. Manufacturer: Romac Industries, Inc., Model DJ405, or equal.

2.12 SPECIALTIES

A. Pressure and Compound Gages
1. Pressure gages shall be provided on the suction and discharge of all pumps.
2. Pressure and compound gages shall be bourdon tube type, stem mounted, with a 4-1/2 inch diameter aluminum case, grade A phosphor bronze tube and shall have the range indicated on the Drawings. Where indicated, case shall be provided with mounting flange for fastening gage to brace. Pressure and compound gages shall be Ashcroft Type 1010, Amtek, or approved equal. The air gauges must be temperature rated for 250°F.
3. Each gage shall be provided with the manufacturer's shutoff cock. On all process systems each gage shall be provided with a shutoff cock, diaphragm seal and flushing connection as shown on the drawings. Diaphragm seal shall be Ashcroft Type 101 with Teflon coated stainless steel diaphragm and shall be filled with silicone. Diaphragm seals shall be filled, connected to gate and calibrated as a complete unit, at the factory.

2.13 MECHANICAL COUPLING FOR AIR MAINS

1. Mechanical couplings may be used in lieu of flange joints for stainless steel air piping.

2. Coupling Housing – Stainless Steel T316.

3. Gasket EPDM conforming to ASTM D2000 up to 240oF.

4. Bolts and Nuts – Stainless Steel ASTM A276, T304, minimum tensile strength 85,000 psi. All stainless steel bolt threads shall be coated with nickel anti-seize compound prior to assembly.

5. Manufacturer: Depend-O-Lok, or equal.

2.14 MECHANICAL EXPANSION COUPLING FOR AIR MAINS

1. Mechanical expansion coupling may be used in lieu of expansion joints specified above.

2. Coupling Housing – Stainless Steel T316.

3. Gasket EPDM conforming to ASTM D2000 up to 240oF.

4. Bolts and Nuts – Stainless Steel ASTM A276, T304, minimum tensile strength 85,000 psi. All stainless steel bolt threads shall be coated with nickel anti-seize compound prior to assembly.

5. Manufacturer: Depend-O-Lok, or equal.

PART 3 EXECUTION

3.1 EXPANSION

A. The installation of all pipes shall be such as to allow for expansion using expansion joints, as shown on the drawings or as may be necessary to prevent undue strain on piping.

B. Expansion joints shall be flanged end, bellows type. Units shall be of neoprene construction and shall be suitable for use in the service intended. The exterior of the expansion joints shall be suitable for outside service. All units to be provided for use in sludge systems shall have a filled arch. Flanges shall be of hot-dipped galvanized steel construction, with flat-face suitable for mating to ductile iron flanges. Retainer rings shall be constructed of hot-dipped galvanized steel. Expansion joints shall be the Model 500N of Mercer Rubber Company, or approved equal.

3.2 CONNECTION AT DISSIMILAR METALS

A. Wherever pipes of dissimilar metal join, there shall be provided an insulating union, coupling or flange connector for corrosion control. Connectors shall include an approved type dielectric separator. Connectors shall be the product of Dresser Corporation, or approved equal. Stainless steel nuts, bolts, and washers shall be used at all places at which such dielectric separators are used.

3.3 THRUST RESTRAINT

A. Provide pressure pipeline with restrained joints or concrete thrust blocking at all bends, tees, and changes in direction. If restrained joints are utilized, submit design calculations showing determination of restrained lengths and submit joint restraint details. Method of joint restraint shall utilize devices

specifically designed for the application for which manufacturer's data is available for the application. Submit manufacturer's literature for approval.

3.4 JOINTS

A. All joints at equipment shall conform to the equipment requirements. No direct welded connections shall be made to valves or other equipment. Right and left couplings, long screws, or caulking of pipe threads or gasket joints will not be permitted. Mitered joints for elbows and matching straight runs of pipe for tees or elbows will not be permitted.

B. Soldered or brazed joints shall be made with solder and a noncorrosive paste flux. The solder mixture shall be of 95-5 (tin-antimony) content. The use of acid core solder shall not be permitted. The application of excess heat shall be avoided to prevent undue softening or burning of the fittings or tubing when making connections. All soldering operations shall be performed in strict accordance with best accepted practices. Tubing shall be square cut and reamed to remove all burrs. The inside of the fittings and the outside of the tubing at each end shall be well cleaned immediately prior to soldering to remove all traces of oxidation, regardless of how clean the surfaces of the pipe and fittings may appear.

C. Welded joints, if required in the project, shall be made by the electric arc or oxyacetylene gas process. Only thoroughly experienced certified pipe welders shall be employed for the work. The welding wire used shall be coated heavily and shall be of material suitable for making the best possible pipe welds. After being welded, the piping, when tested as specified hereinafter, shall show no indication of leakage, weakness, and other defects. Welding and welders shall be in accordance with the paragraph entitled “Certification of Welders” specified herein before.

3.5 IDENTIFICATION OF PIPING SYSTEMS

A. All piping systems located inside structures that are listed in the schedule at the end of the section shall be stenciled with the name of the service to indicate the use of that particular pipe, and an arrow showing the normal direction of flow. Stencils shall be plain block letters of the size adequate to read from the floor or walking surface. Stenciled names shall be located near each branch connection, near each valve and at least every 25 feet on straight runs of pipe. All stenciled names shall be so located as to be legible from the floor. Generally, letters on light colored pipes shall be either black or red; on dark colored pipes letters shall be white. Stenciled names shall be applied after the piping has been tested, covered (if required) and painted. Stainless piping shall be stenciled in black. Color coding and names are as specified herein. Any system inadvertently not listed shall be stenciled as directed by the Engineer. Paint all valves and operators the same color as the piping.

B. All materials shall be applied in accordance with the manufacturer’s recommendation.

C. No bright metal parts such as stainless steel, chromeplate, etc., shall be painted. Nor is it intended to paint stainless steel, copper, brass, or aluminum pipes. Pipes of these metals, however, shall be color coded, banded with colors indicated below with 6 inch wide bands not less than 8 feet on centers. PVC piping shall be painted.

D. The various systems shall be painted and identified in accordance with Specification Section 09 91 25.

E. All valves shall be provided with identification tags. Valve tags shall be 3/32 inch thick engraved plastic, 2-1/2 inches in diameter, with black engraved lettering on a white background. Lettering and/or numbering shall be ¾ inches high, shall be on both sides of the tag and shall correspond to the valve designations required by the Engineer. Valve tags shall be fastened through a small predrilled angular hole through the valve tag and secured with a meter seal. Valve tags shall be as manufactured by the Seton Name Plate Corporation, or approved equal.

3.6 TESTING OF PIPES

A. The Engineer shall be notified in advance of all tests and all tests shall be conducted to his entire satisfaction. All tests shall be made prior to insulating piping.

B. Repairs to the various systems shall be made with new materials. No caulking of threaded joints, cracks or holes will be acceptable. Where it becomes necessary to replace pieces of pipe, the replacement shall be the same material and thickness as the defective piece. Tests shall be repeated after defects disclosed thereby have been made good or the work replaced.

C. All piping shall be adequately braced and supported during the tests so that no movement, displacement or damage shall result from the application of the test pressure. Relief devices in the various systems shall be capped or plugged during the tests.

D. All equipment used in testing shall be subject to the approval of the Engineer, and shall be such as to properly develop, maintain and measure test procedures.

E. The test pressure shall be maintained for at least two hours with no pressure drop. All gravity flow piping systems, inside or under the various structures, shall be filled with water and there shall be no drop in level after two hours. Piping systems shall be tested in accordance with the schedules on following page.

3.7 AS-BUILT SHOP DRAWINGS

A. The Contractor shall provide the Engineer with four sets of prints as As-Built Shop Drawings for each interior piping system showing all equipment and valves, together with one set of "mylar" reproducibles. Drawings shall show numbers and/or letters for all equipment and for each valve, as specified herein under Paragraph entitled "IDENTIFICATION OF PIPING SYSTEMS."

(SEE ATTACHED PIPE SCHEDULE)

PIPE SCHEDULE							
SERVICE	**DIAMETER RANGE, INCHES**	**PIPE**		**FITTING**		**TESTING**	
		MATERIAL	**JOINT TYPE**	**MATERIAL**	**JOINT**	**MEDIUM**	**PRESSURE PSIG**
MRAS	4"	DIP	Flanged/ Restrained	Ductile Iron	Flanged	Non-Potable Water	25
Influent	16"	DIP	Flanged/ Restrained	Ductile Iron	Flanged	Non-Potable Water	25
Drain	6"	DIP	Flanged/ Restrained	Ductile Iron	Flanged	Non-Potable Water	25
Drain	3" and smaller	PVC	Solvent Welded	PVC	Solvent Welded	Potable Water	10

Eq Influent and Effluent	6-8”	DIP	Flanged/ Restrained	Ductile Iron	Flanged	Non-Potable Water	50
Post-EQ Effluent	8”	PVC	Solvent Welded	PVC	Solvent Welded	Non-potable water	25
Process Air	4”-10”	Stainless Steel	Welded	Stainless Steel	Welded	Air	15
Potable Water	3” and Smaller	Copper	Threaded/ Soldered	Copper	Threaded	Potable Water	100
Alum	1/2” x 2”	CPVC/PVC	Solvent Welded	CPVC	Solvent Welded	Potable Water	100
MicroC	1/2” x 2”	CPVC/PVC	Solvent Welded	CPVC	Solvent Welded	Potable Water	100
Caustic Soda	1/2” x 2”	CPVC/PVC	Solvent Welded	CPVC	Solvent Welded	Potable Water	100
Alum in Containment Area	1”-3”	CPVC	Solvent Welded	CPVC	Solvent Welded	Potable Water	100
MicroC in Containment Area	1”- 3”	CPVC	Solvent Welded	CPVC	Solvent Welded	Potable Water	100
Non-potable utility water	4”	DIP	Flanged/ Restrained	Ductile Iron	Flanged	Non-Potable Water	100
Non-potable utility water	1-3”	PVC	Solvent Welded	PVC	Solvent Welded	Potable Water	100

END OF SECTION 40 23 19

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SECTION 40 23 21

TESTING PIPING SYSTEMS– PRESSURE TESTING

PART 1 GENERAL

1.1 SUMMARY

A. The work of this section includes, but is not limited to
   1. Deflection Testing – Gravity PVC Pipe
   2. Pressure Pipe Hydrostatic Testing
   3. Disinfection of Potable Water Piping

B. Related Work Specified Elsewhere
   1. Division 31 - Trenching, Backfilling and Compacting
   2. Section 40 23 19 – Pipe and Pipe Fittings
   3. Section 40 23 20 – Valves and Piping Specialties

1.2 QUALITY ASSURANCE

A. Reference Standards
   1. American Society for Testing and Materials (ASTM) C828 Low-Pressure Air Test of Vitrified Clay Pipelines
   2. American National Standards Institute (ANSI); American Water Works Association (AWWA)

      a. ANSI/AWWA C600 Section 4 - Hydrostatic Testing

      b. ANSI/AWWA C651 Disinfecting Water Mains

B. Test Acceptance
   1. No test will be accepted until leakage rate is below specified maximum limits.
   2. The Contractor shall determine and correct the cause of test failures and retest until successful test results are achieved.

1.3 SUBMITTALS

A. Submit in accordance with Section 01300.

B. Submit the following prior to start of testing:
   1. Test Procedures
   2. List of Test Equipment
   3. Testing Sequence Schedule
   4. Certification of test pressure gauge calibration and accuracy.
   5. Certification of composition of chlorination products.

PART 2 PRODUCTS

2.1 DISINFECTION PRODUCTS

A. Liquid Chlorine: AWWA B301.

B. Calcium Hypochlorite and Sodium Hypochlorite: AWWA B300.

2.2 AIR TESTING EQUIPMENT

A. Air Compressor

B. Air Supply Lines

C. Test Connections

D. Pressure Regulator

E. Pressure Relief Valve

F. Pressure Gauge Calibrated to 0.1 lb/sq. inch.

2.3 HYDROSTATIC TEST EQUIPMENT

A. Hydro Pump
B. Pressure Hose
C. Test Connections
D. Pressure Relief Valve
E. Pressure Gauge Calibrated to 0.1 lb/sq. inch.

PART 3 EXECUTION

3.1 PREPARATION

A. Backfill trenches in accordance with Division 31.
B. Provide concrete reaction support blocking, cured a minimum of 7 days, or a minimum of 3 days if high early strength concrete is used, for the pipeline to be tested.
C. Flush pipeline to remove debris; collect and dispose of flushing water and debris in a manner conforming to Regulatory Agency requirements.

3.2 DEFLECTION TESTING – GRAVITY PVC PIPE

The Contractor shall test PVC gravity sewer pipe for deflection in the presence of the Engineer. Deflection testing shall be performed after the pipe trench is completely backfilled, and before permanent trench paving or other surface restoration is done. Testing shall be accomplished using a PHOS Deflection Gauge as manufactured by PHOS, Inc., 4646 Carpinteria Avenue, Carpinteria, CA 93013. The gauge shall be attached to a line and pulled through the pipe manually. All pipe failing to meet the deflection limit of 5% or less shall be removed, replaced, and retested at the Contractor's expense.

3.3 AIR TESTING GRAVITY FLOW PIPELINES

All gravity lines shall be tested by the Contractor in a manner satisfactory to and witnessed by the Engineer.

A. Contractor shall make visual tests as directed by Engineer in order to ascertain if joints are tight and sewer is laid to line and grade. A pressure test, using low-pressure air, shall then by conducted by the Contractor at his own expense.
B. Test each section of gravity flow pipeline between structures; plug all pipeline outlets; brace plugs to offset thrust.
C. Low pressure air shall be introduced into sealed line until internal pressure reaches 4 psig greater than average back pressure of any groundwater that may be over the pipe. At least two minutes shall be allowed for air pressure to stabilize. After stabilization period, pressure in the pipe shall be adjusted to a minimum of 3.5 psig plus average back pressure of any groundwater that may be over the pipe and air supply disconnected. The portion of line being tested shall be termed "acceptable" if the time required for pressure to decrease from 3.5 psig to 2.5 psig (plus average back pressure of any groundwater that may be over the pipe) is not less than the time shown in the Table below.
D. If groundwater is present, determine its elevation above the springline of the pipe by means of a piezometric tube; for every foot of groundwater above the springline of the pipe, increase the starting test pressure reading by 0.43 psig; do not increase pressure above 10 psig.
E. In no case should the starting test pressure exceed 9.0 psig. If the average vertical height of groundwater above the pipe invert is more than 12.7 feet, the section so submerged may be tested using 9.0 psig as the starting test pressure. The 9 psig limit is intended to further ensure workman safety and falls within the range of the pressure monitoring gauges normally used.
F. Allow air pressure to stabilize for at least five minutes; adjust pressure to 3.5 psig or to the increased test pressure as determined above if groundwater is present; start the test.
G. The table below contains specified minimum times required for a 0.5 psig pressure drop from a starting pressure of at least 3.5 psig greater than the average back pressure of any groundwater above the pipe's

invert. If there has been no leakage (zero psig drop) after one hour, the test section is accepted and the test is complete.

H. Record the drop-in pressure during the test period; if the air pressure has dropped more than 1.0 psig during the test period, the line is presumed to have failed; if the 1.0 psig air pressure drop has not occurred during the test period, the test shall be discontinued and the line will be accepted.

I. If line fails to meet requirement, Contractor shall, at his own expense, determine source of leakage. Contractor shall then repair or replace all defective material and/or workmanship and retest the line. Since the test must be conducted after backfilling, rectifications shall include re-excavation and backfill after repairs and/or replacement. All testing shall be performed on sewers before any road replacement of surface restoration operations are started.

J. The Contractor has the option to test the section in incremental stages until the leaks are isolated.

AIR TEST TABLE

Minimum Test Time For Various Pipe Sizes

Nominal Pipe Size	T (time) min/100 ft.	Nominal Pipe Size	T (time), min/100 ft.
3"	0.2	18"	2.4
4"	0.3	21"	3.0
6"	0.7	24"	3.6
8"	1.2	27"	4.2
10"	1.5	30"	4.8
12"	1.8	33"	5.4
15"	2.1	36"	6.0

3.4 HYDROSTATIC LEAKAGE TESTING PRESSURE FLOW PIPELINES

A. Hydrostatically test each section of pressure pipeline at the pressure designated on plans or specifications, based on the elevation of the lowest point in the pipeline corrected to the elevation of the test gauge, for a minimum period of two (2) hours or as approved by the Engineer.

B. Slowly fill the section with water, expelling air from pipeline at the high points; install corporation cocks at high points if necessary; after all air is expelled, close air vents and corporation cocks and raise the pressure to the specified test pressure.

C. Observe joints, fittings and valves under test, remove and renew cracked pipe, joints, fittings, and valves showing visible leakage; retest.

D. After visible deficiencies are corrected, continue testing at the same test pressure for an additional two hours to determine leakage rate.

E. Maintain pressure within plus or minus 0.5 psig of test pressure.

F. Leakage is defined as the quantity of water supplied to the pipeline necessary to maintain test pressure during the period of the test and shall not exceed that determined by the following:

$$L = \frac{SDvP}{133{,}222}$$

Where: L = allowable leakage, in gallons per hour
S = length of pipe tested, in feet
D = nominal diameter of the pipe, in inches
P = average test pressure during the leakage test, in pounds per square inch (gauge).

ALLOWABLE LEAKAGE							
W	**P**	**D (gal/hr/1,000LF)**					
(psi)	**(psi)**	**2”**	**4”**	**6”**	**8”**	**10”**	**12”**
60	100	0.150	0.300	0.450	0.601	0.751	0.901
70	105	0.154	0.308	0.462	0.615	0.769	0.923
80	120	0.164	0.329	0.493	0.658	0.822	0.987
90	135	0.174	0.349	0.523	0.698	0.872	1.047
100	150	0.184	0.368	0.552	0.736	0.919	1.103
110	165	0.193	0.386	0.579	0.771	0.964	1.157
120	180	0.201	0.403	0.604	0.806	1.007	1.209
130	195	0.210	0.419	0.629	0.839	1.048	1.258
140	210	0.218	0.435	0.653	0.870	1.088	1.306
150	225	0.225	0.450	0.676	0.901	1.126	1.351
160	240	0.233	0.465	0.698	0.930	1.163	1.396
170	255	0.240	0.480	0.719	0.959	1.199	1.439
180	270	0.247	0.493	0.740	0.987	1.234	1.480
190	285	0.253	0.507	0.760	1.014	1.267	1.521
200	300	0.260	0.520	0.780	1.040	1.300	1.560
210	315	0.266	0.533	0.799	1.066	1.332	1.599
220	330	0.273	0.546	0.818	1.091	1.364	1.637
230	345	0.279	0.558	0.837	1.116	1.394	1.673
240	360	0.285	0.570	0.855	1.140	1.424	1.709
250	375	0.291	0.582	0.872	1.163	1.454	1.745

W = Maximum Working Pressure within segment of tested pipe

P = Test Pressure = 1.5 x W, but not less than 100 PSI

D = Pipe Diameter (inches)

Example: 2,580 LF of 8” water line with a working pressure of 210 psi is to be tested for leakage.

Solution: The test pressure, P, to be used during leakage test is 1.5 x 210 = 315 psi. From the chart above, P = 315, the allowable leakage per 1,000 LF

of 8" water main is 1.066 gallons per hour. Since 2,580 LF of pipe is being tested, the allowable leakage is 2,580 / 1,000 x 1.066 = 2.7503 gal/hr.

For a 2-hour test, the allowable leakage would be 2 x 2.7503 = 5.5066 gallons. If 5.5 (5 ½) gallons or less must be added to the water line at end of 2 hours to bring the test pressure to 315 psi, the line has passed.

G. If the test of the pipeline indicates leakage greater than that allowed, locate the source of the leakage, make connections and retest until leakage is within the allowable limits.
H. Correct visible leaks regardless of the amount of leakage.

3.5 HYDROSTATIC TESTING PRESSURE PIPING SYSTEMS

A. Applicable to potable water pressure system, chemical feed systems, and all process piping systems within the wastewater treatment plant buildings.
B. Fill entire systems with water and vent air from the system at least 24 hours before the actual test pressure is applied.
C. Apply the required test pressure when the water and average ambient temperatures are approximately equal and constant.
D. Test piping at pressures listed on Yard Piping Plan; avoid excessive pressure on safety devices and mechanical seals.
E. Maintain test pressure for a minimum of 2 hours without drop after the force pump has been disconnected.
F. Visually inspect joints, fittings, and valves while pipe is under test pressure.
G. Correct all visible leaks and retest as often as necessary until satisfactory results are achieved.

3.6 DISINFECTION OF POTABLE WATER PIPING

A. Conduct disinfection of potable water system after completion of satisfactory pressure and leakage testing.
B. Disinfect in accordance with recommended practice established by AWWA C651.
C. Preliminary Flushing
    1. Flush the line at a rate of flow of 2.5 feet per second for a period of 15 minutes; refer to table at end of this Section for the rates of flow to produce a velocity of 2.5 fps.
    2. Provide and install one hydraulically propelled polyurethane "pig" in each line 4 inches or greater in diameter prior to flushing and flush the "pig" through the line; pig shall have the ability to negotiate fabricated mitered bends and short radius elbows and pass through tees, crosses and multi-dimensional sizes of pipe and valves.
    3. Dispose of flushing water in compliance with Federal, State and Local laws.
D. Chlorine Form
    1. The chlorine form to be applied to the system shall be either liquid chlorine, calcium hypochlorite or sodium hypochlorite.
    2. The Engineer's written approval of the chlorine form to be used is required.
E. Chlorine Application
    1. Introduce the chlorine to the system by use of the continuous feed method.
    2. Feed water and chlorine to the line at a constant rate so that chlorine concentration in the pipe is a minimum of 50 mg/L available chlorine.
    3. Continue chlorine applications until the entire system is filled with the chlorine solution.
    4. During the 24-hour treatment, operate all valves, stops, and hydrants in the section treated.
    5. At the completion of the 24-hour treatment, the water shall contain a minimum of 25 mg/L chlorine throughout the line.
    6. Repeat the disinfection process until the specified minimum available chlorine is present at the end of the treatment sequence.

F. Final Flushing
   1. Flush the heavily chlorinated water from the system under treatment until the chlorine concentration in the water leaving the system is less than 1 mg/L.
   2. Comply with federal, state and local laws when discharging the flushed disinfecting chlorine solution.

G. Bacteriological Testing
   1. After final flushing is completed and before the water main is placed in service, test the line for bacteriologic quality.
   2. Collect a minimum of 2 samples 24 hours apart in sterile bottles treated with sodium thiosulfate (metering requirements of the MDE).
   3. Provide bacteriological test reports to the Owner and the Engineer; failure to meet State Health Standard requirements will be cause for the Contractor to re-chlorinate and retest the system, at no additional cost to the Owner.

TABLE

Required Flow to Flush Pipelines *(a)

Pipe Diameter (Inches)	Flow Required to Produce 2.5 fps Velocity in gpm	Size of Tap on Main (inches) *(b)	Hydrant Outlets Size Number (Inches)	
4	100	15/16	1	2-1/2
6	220	1-3/8	1	2-1/2
8	390	1-7/8	1	2-1/2
10	610	2-5/16	1	2-1/2
12	880	2-13/16	1	2-1/2

*(a) With a 40-psi pressure in main, hydrant flowing to atmosphere, a 2-1/2" hydrant outlet will discharge approximately 1,000 gpm.

*(b) Size of tap on main with no length of discharge piping.

END OF SECTION 40 23 21

SECTION 40 23 36.12

PIPE HANGERS AND SUPPORTS

PART 1 GENERAL

1.1 SUMMARY

A. This section includes requirements for providing pipe hangers, brackets, supports, and spacing of expansion joints in piping systems as indicated in accordance with the Contract Documents. Pipe supports shall be furnished complete with all necessary inserts, bolts, nuts, rods, washers, and other accessories.

B. The Contractor shall be responsible for the design of pipe saddles and related supports where specific detail is not provided. The Contractor shall be responsible for the final coordinated design of these saddles and supports and shall submit details and design calculations to document that the pipe saddles and supports have been designed and coordinated to meet the design requirements defined hereinafter.

1.2 JOB CONDITIONS

A. In certain locations, pipe supports and anchors are shown on the drawings, but no attempt has been made to indicate every pipe support and anchor. It shall be the Contractor's responsibility to provide complete system of pipe supports and to anchor all piping in accordance with this section.

B. Concrete and fabricated steel supports shall be as indicated on the drawings, as specified in other sections, or, in the absence of such requirements, as permitted by the Engineer.

C. All piping shall be rigidly supported and anchored so that there is no movement or visible sagging between supports.

D. Expansion joints are not required in buried piping, but concrete supports, blocking or other suitable anchorage shall be provided as indicated on the drawings or specified in other sections.

1.3 SUBMITTALS

A. Design calculation and details for pipe saddles, hangers and supports bearing the stamp of a registered professional engineer in the State of Maryland.

B. Shop drawings in conjunction with Specification Sections for piping, valves and pumps, showing the location of all pipe supports for pipes two-inches and larger. Shop drawings shall show fabrication and installation details.

C. Catalog data for all hangers, supports and associated components to be used.

D. Manufacturer's installation instructions.

1.4 DESIGN CRITERIA

A. The following design conditions shall be used for design of the pipe saddles, supports and hangers.
   1. Operating pressure shall be equal to the test pressure defined in Section 40 23 36.13.
   2. Operating temperature range:
      a) For process pipes the design temperature range shall be 10 degrees Fahrenheit to 80 degrees Fahrenheit.
      b) For potable and utility water the design temperature range shall be 10 degrees Fahrenheit to 80 degrees Fahrenheit.

c) All other pipes shall be designed for similar ranges as appropriate.

PART 2 PRODUCTS

2.1 GENERAL

A. Pipe supports shall comply with ANSI/MSS SP-58 and MSS SP-69 and Federal Specification WW-H-1713. Load carrying and coating tests will not be required.

B. Pipe supports specified are identified by manufacturer's name and catalog number.

C. Pipe supports shall be manufactured for the size and type of pipe to which they are applied. Straphangers will not be acceptable. Threaded rods shall have threading to permit the maximum adjustment available in the support item.

D. Pipe supports shall be furnished complete with all necessary inserts, bolts, nuts, rods, washers, and other accessories.

E. Contact between dissimilar metals, including contact between stainless steel and carbon steel, shall be prevented. Supports for brass or copper pipe or tubing shall be copper plated. Those portions of pipe supports which contact other dissimilar metals shall be rubber or vinyl coated.

2.2 DESCRIPTION

Pipe support types and application shall comply with the following.

Description or Size	MSS SP-69	Manufacturer and Model
A. Hangers		
2-½-inch and smaller pipe,		
adjustable J	5	B-Line Fig. B3690, Grinnell Fig. 104, or approved equal.
clevis	1	Grinnell Fig. 65, B-Line Fig. B3104, or approved equal.
3-inch through 10-inch pipe		
clevis	1	Grinnell Fig. 260, B-Line Fig. B3104, or approved equal.
12 inch and larger pipe		
clevis	1	Grinnell Fig. 260, B-Line Fig. B3102, or approved equal

	Description or Size	MSS SP-69	Manufacturer and Model
B.	Standard weight and extra strong steel pipe and stainless steel pipe (all sizes)		
	uninsulated, steel pipe clamp	4	Elcen “1”, Fee & Mason “236", ITT Grinnell “212", or approved equal
C.	Concrete Rod Attachment Plate, 6-inch and smaller pipe	19	Grinnell Fig. 52, or approved equal.
D.	Turnbuckles, Steel	13	Elcen 81, Fee & Mason 2382, Grinnell Fig. 230, or approved equal
E.	Hanger Rods, Carbon Steel, threaded both ends, ½-inch minimum size	--	Elcen 72, Fee & Mason 267, Grinnell Fig. 140, or approved equal.
F.	Wall Supports and Frames, steel 12 inch and smaller pipe		
	brackets	33,34	Grinnell Fig. 195 & 199; B-Line Fig. B3066 & B3067, or approved equal.
	prefabricated channels, galvanized	--	12 gauge, 1-5/8" x 1-5/8" with suitable brackets and pipe clamps.
	offset pipe clamp, 1-1/2-inch and smaller pipe, galvanized	--	1-1/4" x 3/16" steel, with 3/8" bolts.
	offset pipe clamp, 2-inch to 3-1/2-inch pipe, galvanized	--	1-1/4" x 3/16" steel, with 3/8" bolts.
G.	Pipe Riser Clamps		
	cold piping system	–	Pipe Shields, Inc., “E1000", or approved equal
	copper tubing	–	CT-121 or CT-121C

	Description or Size	MSS SP-69	Manufacturer and Model
	other piping systems	–	Grinnell “261", or approved equal
H.	Floor Supports, steel or cast iron, 6-inch and smaller pipe	38 (with base)	Grinnell Fig. 259; B-Line Fig. B-3095, or approved equal.
	8 inch through 24 inch pipe	38	B-Line “B3093", Grinnell “264", or approved equal

PART 3 EXECUTION

3.1 LOCATION AND SPACING

A. Piping shall be supported approximately 1-1/2 inches out from the face of walls and at least 3 inches below ceilings or beams. The maximum spacing for pipe supports and expansion joints shall be:

Type of Pipe	Pipe Support Maximum Spacing, Feet	Maximum Run without Expansion Joint, Loop or Bend, Feet (See Note 1)	Expansion Joint Maximum Spacing, Feet (See Note 2)	Type of Expansion Joint
Ductile Iron	15	80	80	Mechanical Couplings
Steel:				
1-1/4-inch and smaller	7	30	100	Note 3
1-1/2 and larger	10	30	100	Note 3
Copper:				
1-inch and smaller	5	--	--	None required
Over 1-inch	7	50	100	Note 3
PVC:				
1/8- and 1/4-inch	Continuous Support	20	60	None required

½- to 2-inch	4	20	60	None required
Over 2-inch	6	20	60	None required
Cast Iron Soil Pipe:	10	–	–	None required

Notes:
1. Unless otherwise permitted, an expansion joint shall be provided in each straight run of pipe having an overall length between loops or bends exceeding the maximum run specified herein.
2. Unless otherwise permitted, the spacing between expansion joints in any straight pipe run shall not exceed the maximum spacing specified herein.
3. Expansion joint fittings as specified in the miscellaneous piping section.
4. At least two properly padded supports for each pipe section.
5. At least one support for each pipe section.

3.2 INSTALLATION

A. Concrete inserts or L-shaped anchor bolts shall be used to support piping from new cast-in-place concrete. Expansion anchors shall be used to fasten supports to masonry.

B. Design loads for inserts, brackets, clamps, and other support items shall not exceed the manufacturer's recommended loads.

C. Anchorage shall be provided to resist thrust due to temperature changes, changes in diameter or direction, or dead ending. Anchors shall be located as required to force expansion and contraction movement to occur at expansion joints, loops or elbows, and as required to prevent excessive bending stresses and opening of mechanical couplings. Anchorage for temperature changes shall be centered between elbows used as expansion joints.

D. Provide dielectric isolation. Do not allow copper and other metals to make contact with each other.

E. All piping shall be supported and anchored so that there is no movement or visible sagging between supports.

F. Pipe supports shall be manufactured for the size and type of pipe to which they are applied. Straphangers will not be acceptable. Threaded rods shall have sufficient threading to permit the maximum adjustment available in the support item.

G. Vertical Piping:
   1. Secure at sufficiently close intervals to keep pipe in alignment and to support weight of pipe and its contents.
   2. Support vertical iron and steel pipe on maximum 5'-0" centers with steel pipe riser clamps.
   3. Support vertical copper tubing at no more than 10'-0" spacing, using plastic coated steel pipe riser clamps or pipe clamp hangers at end of runs and at intermediate points as installation dictates.
   4. Support vertical plastic pipe at 4'-0" centers, using plastic coated pipe riser clamps or pipe clamp hangers at end of runs and at intermediate points as installation dictates.

H. Horizontal Piping:
   1. Support at sufficiently close intervals to prevent sagging, thrust restraint, and vibration.

2. Install hangers or supports at ends of runs or branches, at valves, and at each change of direction or alignment.
3. Install steel clevis-type pipe hangers for horizontal iron and steel pipe on maximum 10'-0" centers.
4. Install steel clevis-type pipe hangers for copper tubing on 6'-0" centers for 1-1/4" size and smaller, and on 10'-0" centers for copper tubing larger than 1-1/4" size.
5. Install plastic coated ring-type pipe hangers for horizontal plastic pipe on maximum 4'-0" centers, close to every joint, at ends of each branch, and at each change in direction of elevation; hangers shall not compress, distort, cut or abrade plastic piping and shall permit free movement of the pipe.

I. The Contractor is responsible for properly bracing piping against lateral movement or sway. The Engineer shall review with the Contractor and approve method of bracing of piping at each location prior to Contractor proceeding with the installation of the bracing. Bracing shall be installed at all locations where sway is anticipated and as directed by the Engineer.

J. Rubber hose and flexible tubing shall be provided with continuous angle or channel support.

END OF SECTION 40 23 36.12

SECTION 44 42 56

CHEMICAL FEED SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. The work of this section includes, but is not limited to
   1. Chemical feed systems for:
      a. Micro-C 2000™, or "Micro-C"
      b. Sodium Hydroxide

B. Related work specified elsewhere
   1. DIVISION 25 Process Control System
   2. DIVISION 26 Electrical
   3. Section 25 50 50 Description of Operation
   4. Section 40 23 20 Pipe & Pipe Fittings
   5. Section 40 23 20 Valves and Piping Specialties
   6. Section 40 23 21 Testing Piping Systems

C. All chemical feed pumps per each chemical feed system shall be the product of one manufacturer.

D. Reference Standards
   1. ASTM D2563 Classifying Visual Defects in Glass Reinforced Plastic Laminate Parts
   2. ASTM D2583 Indentation Harness of Plastic by Means of a Barcol Impressor
   3. ASTM D3299 Filament-Wound Glass-Fiber Reinforced Polyester Chemical-Resistant Tanks
   4. ASTM D4079 Contact-Molded Glass-Fiber Reinforced Thermoset Resin Chemical-Resistant Tanks

E. Tank Design Safety Factors
   1. 10:1 for internal pressure for contact molding.
   2. 0.001 in/in strain limit for filament winding, 5:1 for vacuum collapse.
   3. Strength of joints shall be equal to strength of shell.

F. Factory Testing
   1. Visually inspect the tanks after fabrication to ensure Acceptance Level II requirements of ASTM D2563 are met.
   2. Perform the following during shop inspection:
      a. Check for compliance with drawing dimensions.
      b. Acetone wipe test to check surface cure; no surface tackiness is permitted.
      c. Hydro test of at least 24 hours to check for leaks.

1.2 SUBMITTALS

A. Shop Drawings and Product Data
   1. Submit detailed certified dimensional shop drawings and manufacturer's product data for materials and equipment, including wiring and control diagrams.
   2. Show complete information concerning materials of construction, fabrication, protective coatings, installation, anchoring and layout requirements, fasteners, and other details.

3. Submit calculations for determination of shell thickness, nozzle reinforcement, and all special elements of the vessel construction and support.
4. Submit certified data on the physical properties of the laminates being used to include laminate tensile modulus and flexural modulus in the hoop and axial directions, and data on the laminate makeup to include the number and thickness of layers and the layer glass content.

B. Equipment Certification
1. At the time of submitting shop drawings, submit, on the form provided, the equipment manufacturer's warranty and certification for the tank and for the chemical feed pumps attesting that the manufacturer has examined the Contract Drawings and specifications and that the equipment provided will meet the performance criteria and conforms to specification requirements.
2. Before shipment, submit certified list of tanks containing the same chemical and concentration that have been in service for a period of at least 5 years.

C. Maintenance Data and Operating Instructions
1. Submit required number of copies of an Operation and Maintenance Manual for the chemical feed pump, including a detailed description of the function of each principal component, procedures for operation, and instructions for overhaul and maintenance.
2. Include lubrication schedule, safety precautions, test procedures, electrical schematics, and parts lists.

D. Maintenance Material: (Spare Parts)
1. Provide one complete set of the manufacturer's recommended spare parts for one pump of each type.
2. Package each part individually or in sets in moisture-proof containers or wrappings, clearly labeled with part name and manufacturer's part/stock number.
3. Submit, in writing, storage procedures for spare parts to ensure adequate protection after delivery.
4. Provide any special tools required for equipment maintenance.
5. Provide a list of all equipment and tools needed to maintain and calibrate equipment.

EQUIPMENT GUARANTEE CERTIFICATION FORM

Reference: **"SMITHSBURG WWTP ENR UPGRADE AND EXPANSION"**

THE UNDERSIGNED HEREBY ATTESTS THAT HE/SHE HAS EXAMINED THE REFERENCED PROJECT DRAWINGS AND SPECIFICATIONS SECTION **44 42 56** AND CERTIFIES THAT THE **"CHEMICAL FEED SYSTEMS"** THAT HE/SHE PROPOSES TO FURNISH AND DELIVER MEETS OR EXCEEDS CONTRACT SPECIFICATIONS, IS SUITABLE FOR THE INTENDED PURPOSE STATED IN SPECIFICATIONS SECTION **44 42 56**, IS SUITABLE FOR INSTALLATION AS PRESENTED IN THE ABOVE PROJECT DRAWINGS AND SPECIFICATIONS, AND WILL PROVIDE SATISFACTORY PERFORMANCE AT THE DESIGN CRITERIA SPECIFIED. THIS GUARANTEE OF SUITABILITY FOR INTENDED PURPOSE IS IN ADDITION TO AND SHALL NOT BE IN LIEU OF ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED.

EQUIPMENT: **"CHEMICAL FEED SYSTEMS"**

MANUFACTURER: _____

Address: _____

_____

By: _____
(Typed Name and Title)

_____/s/_____ (SEAL)
(Signature) (Date)

Equipment Guarantee Certification must be signed by a Principal Person (President, Vice-President, etc.) of the equipment manufacturer. In the event the manufacturer is not the Supplier then a Principal Person of the Supplier must also sign this form.

SUPPLIER: _____

Address: _____

By: _____
(Typed Name and Title)

(SEAL)

_____/s/_____

1.3 FIELD SERVICES

A. Provide the services of the chemical feed pump manufacturer's representative experienced in the installation and operation of the equipment supplied under this specification for not less than two 8-hour workdays on-site for installation inspection, start-up and performance testing, and instructing Owner's personnel in the operation and maintenance of the equipment.

PART 2 PRODUCTS

2.1 CHEMICAL FEED SYSTEMS

A. Furnish and install a liquid Micro-C feed system complete with storage tank, feed pumps, and specified adjunct equipment all suitable for handling commercial grade and solution strength of Micro-C 2000™.

B. Furnish and install specified adjunct equipment for a sodium hydroxide feed system to be operated in the future. All equipment shall be suitable for handling commercial grade and solution strength sodium hydroxide.

C. Chemical storage tanks and exterior above grade piping shall be insulated and heat traced to prevent the chemical from crystallizing and freezing. The Contractor is responsible for providing the power and all controls to provide a complete operation system.

2.2 MICRO-C STORAGE TANK

A. General Description
   1. A Micro-C storage tank shall be provided with a 1,500 gallon storage capacity.
   2. The tank shall be one piece, rotationally molded of linear polyethylene.
   3. Use appropriate materials of construction to resist and retain the process fluid without leakage or damage to the structural integrity of the tank; use the same resin throughout the construction of each tank. Provide nexus or C-veil as necessary.
   4. Tank material shall be suitable for storage of a 100% Micro-C solution having a specific gravity of 1.25.
   5. Tanks are located outdoors and must be provided with heat tracing.

B. Contact molded, fully gusseted nozzles of the same material as the tank.

C. Press molded accessories are not permitted in contact with the stored material.

D. All flanged nozzles to have standard 125 lb. drilling.

E. Storage Tank Construction:
   1. Vertical, non-sloping, flat bottom, closed dome top.
   2. Mount the tank indoors in concrete retaining basin as shown on the contract drawings.
   3. Mechanical Properties
      a. The minimum for the properties of the material shall be as follows based on molded parts:

Property	ASTM	Value	Unit
Density	D1505	59 (0.937-0.942)	#ft^3(gm/cc)
ESCR Spec. Thickness 125 mils F-50	D1693	1000	Hrs.
Tensile Strength	D638		
Ultimate 2"/min.	Type IV Spec.	2600	PSI
Elongation at break	D638		
2"/min.	Type IV Spec.	450	%
Vicat Softening Temp.	D1525	240	Deg. F

Property	ASTM	Value	Unit
Brittleness Temp.	D746	-180	Deg. F
Flexural Modulus	D790	100,000 - 110,000	PSI

4. The finished surface of the tank shall be free as commercially practicable from visual defect such as foreign inclusions, air bubbles, pin holes, craters, crazing and cracking that will impair the service of the tank.
5. All edges cut out; i.e., open top flanges, man-ways, shall be trimmed to have smooth edges.
6. All dimensions will be taken with the tank in its proper, usable position and unfilled. Tank dimensions will represent the exterior measurements.
    a. Outside diameter - The tolerance for the outside diameter including out of roundness, shall be ±3%.
    b. Shell wall and head thickness - The tolerance for thickness shall be ±20% of the design thickness. The total amount of an area on the low side of the tolerance shall not exceed 10 times the total area and individual area shall be not exceed 1 $ft.^2$ (.09m2) in size.
7. Provide the tank with enough individual 208V, 1 phase heating mats sized to maintain liquid contents at 60°F at 0°F ambient temperature.
8. Provide one adjustable thermostat housed in a fiberglass NEMA 4X enclosure mounted on the tanks shell wall for temperature control; thermostat will be utilized for the control of all the tank heating mats.
9. A stainless steel capillary bulb connected to the uppermost corner of the highest heat mat shall be connected o the thermostat for sensing tank temperature.
10. A second thermostat is to be provided to serve as a high limit cutout to override the temperature control thermostat when the tank temperature exceeds 175°F
11. High limit thermostat is also to be housed in a RFP enclosure mounted on the tank wall and be tied to a stainless steel capillary connected to one of the heating mats.
12. Heating mat systems which incorporate an integral bi-metal thermostat in each mat as a means for hi-temperature cutoff will be acceptable in lieu of the external hi-temperature cutout thermostat.
13. Mount thermostats and install heat mats according to the manufacturer's instructions; provide the necessary clearances around fittings to prevent hot spots; each heat mat shall be individually replaceable.
14. Ship accessory cutout blanks (except manways) with the tank for additional testing, if required. Identify the cutouts by accessory description.

F. Storage Tank Accessories
1. 24" I.D. flanged, top-mounted manway with hinged cover.
2. 3" dia. flanged type drain, capable of completely draining tank.
3. 3" dia. flanged overflow connection.
4. 3" dia. flanged nozzle in roof adjacent to top manway for level probe.
5. 4" dia. flanged vent pipe with bird screen.
6. 2" dia. flanged top fill connection.
7. 3" dia. flanged suction connection.
8. Ladder with safety cage.
9. Ladder system shall comply with OSHA requirements for fixed ladders.
10. Ladder, cage, handrail and grating shall be fiberglass as specified in Section 06 60 00.

G. Anchoring System
1. Provide each storage tank with FRP hold down lugs with stainless steel anchor bolts. A minimum of 8 lugs are required per tank.

2. The anchorage details and calculations must be submitted with the tank shop drawing.

H. Tank Nameplate
1. Mark tank with an encapsulated paper tag or stainless steel nameplate not less than 4"x6" in size and attach to the outside of the tank wall.
2. The following information shall be printed on nameplate:
   a. Name of manufacturer
   b. Capacity in gallons
   c. Manufacturer serial number
   d. Year built
   e. Maximum specific gravity
   f. Design pressure and temperature
   g. Resin

I. Tanks shall be manufactured by Justin Tanks, LLC, Chemtainer Industries, or Poly Processing Company.

2.3 Micro-C FEED PUMPS

A. Type: Provide three (3) positive displacement peristaltic type metering pumps suitable in all respects for handling the specified formulation of Micro-C.

B. Pump Design and Performance Criteria:
1. Provide metering pumps with the following design and performance criteria:
   a. Capacity: 40.5 GPD
   b. Minimum Turndown: 3:1
   c. Max Discharge Pressure: 100 psig
   d. Liquid Pumped: 100% Micro-C solution
2. Chemical feed pumps shall be 530 Series Process Pump as manufactured by Watson-Marlow Pumps Group or approved equal.

C. Pump head shall consist of a fixed track, a hinged guard door, two spring-loaded tube clamp mechanisms, and spring-loaded roller rotor assembly. Pump tubing shall be in contact with the inside diameter of the track through an angle of 180 degrees and be held in place on the suction and discharge by a spring loaded self-adjusting clamp mechanism. At all times, one roller shall be fully engaged with the tubing providing complete compression and preventing back flow or siphoning. Tube occlusion and spring tension shall be factory set to accommodate 2.4mm wall thickness tubing and shall not require adjustment for accommodating tubing of 1.6mm to 9.6mm ID.

D. Pump Head Assembly
1. Pump Track Geometry must have a minimum 96.6mm swept diameter through a minimum track angle of 120 degrees. Provide high corrosion/impact materials as specified:
   a. Track Construction: Polyphenylene sulfide (PPS)
   b. Guard Construction: Hinged impact-resistant polycarbonate breakaway guard, tool un-lockable for operator safety.
   c. Rotor Construction: Polyphenylene sulfide (PPS)
2. Provide two spring–loaded adjustable tube retainer mechanism to secure the tubing at the entry and exit points of the pump head.
3. The rotor assembly shall ensure gradual tube occlusion and compensates for tube tolerance. The twin spring-loaded roller arms located 180 degrees apart, each fitted with stainless steel helical springs and compressing roller for occlusion of the tube twice per rotor revolution. The

compressing rollers shall be 316SS with low friction stainless steel bearings and PTFE seals, minimum diameter of 18mm. Provide non-compressing guide rollers constructed of corrosion resistant Nylatron. Equip rotor with a central handgrip hub and manually activated clutch to disengage the rotor from the drive for manual rotor rotation during tube loading. Clutch shall automatically reengage rotor to gearbox upon one complete revolution. Mounting shall prevent slip; the rotor assembly shall be axially secured to the dogged output shaft of the gearmotor via a slotted collect and central retaining screw.

E. Tubing:
1. Pump tubing shall be in contact with the inside diameter of the track (housing) through an angle of 180 degrees and be held in place on the suction and discharge by tube retainer clamps. The tubing shall be replaceable without the use of tools and with no disassembly of the pump head. To achieve maximum flow per revolution, pump heads with a track angle of less than 180 degrees are not acceptable.
2. Pump tubing shall be constructed of Marprene II, a thermoplastic elastomer with a 64 Shore A durometer and 2.4mm wall thickness. If required for chemical compatibility, pump manufacturer shall recommend an alternate tubing material.
3. Pump shall readily accept tubing ID's of 1.6mm, 3.2mm, 4.8mm, 6.4mm. 8.0mm or 9.6mm without pump adjustment or replacement. Tubing with a wall thickness less then 2.4mm is not acceptable.
4. Supply 15-meter roll of specified tubing size.

F. High Lubricant Leak Detector:
1. Provide a float type magnetic reed switch located near the top of the pump to detect leakage of pumped product into the pump housing.
2. Supply sensor "Normally Closed" with the ability for field adjustment to "Normally Open".
3. Pump manufacturer to supply switch only. Contractor is responsible for alarm and relay to turn pump off unless otherwise specified herein.
4. Float switch shall be rated to the following maxima:

Vmax = 240VAC, Imax = 1 Amp, Pmax = 50VA

2.4 PUMP DRIVE SYSTEM

A. The integral electronic variable-speed gearmotor shall consist of the gearing, motor, and variable-speed controller integrally mounted together as a single configured unit with UL listing. Pumps requiring separate VFD's are not acceptable.
1. Rating: Continuous 24 hour operation, 40° C ambient.
2. Supply: 110-120V 50/60 Hz and 220-240V 50/60 Hz, 1-Phase field switchable. Supply nine-foot length mains power cord with standard 115V three-prong plug.
3. Maximum Drive Power Consumption: 135VA.
4. Enclosure: NEMA 4X or 3R
5. Housing: Pressure cast aluminum with Alocrom pre-treatment and exterior grade corrosion resistant polyester powder coat. By nature of the environmental conditions, unpainted housings, including 316SS, are not acceptable.
6. Pumps must meet the following minimum requirements for operator interface functionality. Pumps not meeting this minimum functionality will not be accepted.
    a. Backlit graphical LCD capable of up to four lines of text with up to 16 characters per line to display pump speed, running status, flow rate, and programming instructions

b. Keypad for start, stop, speed increment, speed decrement, forward/reverse direction, rapid prime, and programming.
c. Menu driven on screen programming of manual or auto control, flow and remote signal calibration, and general programming.
d. Programmable "Auto Restart" feature to resume pump status in the event of power outage interruption.
e. Programmable "Keypad Lock" to allow operator lockout of all keys except emergency start/stop.
f. Programmable "Maximum Speed" to allow operator to set the maximum speed of the pump within 0.1-220 rpm.

7. Supply auto control features to meet the following minimum functionality requirements. Pumps not meeting this minimum functionality will not be accepted.
   a. Remote Control Inputs:
      1) Speed Control:
         a) Analog 4-20mA or 0-10VDC, with input signal trimmable and speed scalable over any part of the drive speed range.
         b) Provisions for alternative remote accessory potentiometer (if supplied by others)
      2) Start/Stop Control: Via 5V TTL, 24V industrial logic, or dry contact- Configurable command sense allowing open to equal run or open to equal stopped. Configurable to be a keypad start/stop override in Manual mode
      3) Forward/Reverse Control: Via 5V TTL, 24V industrial logic, or dry contact
      4) Auto/Man Mode Control: Via 5V TTL, 24V industrial logic, or dry contact
      5) Leak Detector Run/Stop Control
   b. Status Outputs:
      1) Four relay contacts rated for 30 VDC with maximum load of 30W, NO or NC software configurable to indicate the following:
         a) Running/Stopped status
         b) Forward/Reverse status
         c) Auto/Manual status
         d) General Alarm status
         e) Leak Detected status
      2) Speed output – Analog 0-10 VDC or 5V Square Wave Frequency output
   c. Termination: Supply screw down terminals suitable for up to 18 AWG field wire and accessible through four glanded cable entry points on the pump
8. Drive motor- brushless DC motor with integral gearbox and tachometer feedback.
   a. Speed Control Range of 2200:1 from 0.1 to 220 rpm +/- 0.1 rpm throughout the range.
   b. Closed loop microprocessor controlled drive with pulse width modulation at speeds above 35 rpm and synchronous mode with magnetic field rotation control below 35 rpm
   c. Circuitry complete with temperature and load compensation and protection.
9. Mounting: Drive shall be self-supporting and shall not require anchoring.
10. Leak Detection:
    a. Factory-mount a capacitance type tube monitor directly under the pump head, which shall shut the pump down in the event of a detected leak. Capacitance sensor shall be equipped with a sensitivity adjustment, reset pushbutton, and fault indicator LED.

2.5 MICRO-C FEED SYSTEM ADJUNCT EQUIPMENT

A. General: Refer to the Contract Drawings for the number and connection sizes required for the chemical feed system adjunct equipment.

B. Mounting Shelf: Provide a mounting shelf suitable for bolting to building floor to support pumps and pumped medium. Mounting shelf shall be fiberglass with stainless steel mounting bolts.

C. Provide reinforced polyethylene tubing with compression type tubing adapters for each pump. Tubing shall have a 150 psi minimum working pressure rating. Tubing adapters shall be compatible with chemicals being pumped.

D. Calibration Column: Provide one calibration column for each pump made of clear PVC with permanently marked graduation in ounces. Provide unit with a bottom female NPT threaded connection. Volume of column shall be sufficient to run pump at full capacity for two minutes minimum.

E. Connector: Provide connector with a quick disconnect coupling, cap, and chain all of stainless steel construction. The connector shall be as manufactured by OPW, Division of Dover Corporation, Cincinnati, Ohio, or equal.

F. Provide pressure gauges for each pump with a range from 0-150 psi.

G. Pressure Relief Valve: Provide a pressure relief valve for the discharge of each pump. Valve shall be of the same design as the backpressure valve. Set relief pressure to the chemical metering pump manufacturer's recommended setting to protect pump components and accessories.

H. Provide a pulsation dampener for each pump. Pulsation dampeners to be made of CPVC with a Viton bladder. Pulsation dampeners shall be rechargeable bladder type.

2.6 SODIUM HYDROXIDE FEED SYSTEM ADJUNCT EQUIPMENT

A. General: Refer to the Contract Drawings for the number and connection sizes required for the chemical feed system adjunct equipment.

B. Mounting Shelf: Provide a mounting shelf suitable for bolting to building floor to support pumps and pumped medium. Mounting shelf shall be fiberglass with stainless steel mounting bolts.

C. Provide reinforced polyethylene tubing with compression type tubing adapters for each future pump. Tubing shall have a 150 psi minimum working pressure rating. Tubing adapters shall be compatible with chemicals being pumped.

D. Calibration Column: Provide one calibration column made of clear PVC with permanently marked graduation in ounces. Provide unit with a bottom female NPT threaded connection. Volume of column shall be sufficient to run future pump at full capacity for two minutes minimum.

E. Provide pressure gauges for each future pump with a range from 0-80 psi.

F. Pressure Relief Valve: Provide a pressure relief valve for the discharge of each pump. Valve shall be of the same design as the backpressure valve. Set relief pressure to the chemical metering pump manufacturer's recommended setting to protect pump components and accessories.

G. Provide a pulsation dampener for each pump. Pulsation dampeners to be made of CPVC with a Viton bladder. Pulsation dampeners shall be rechargeable bladder type.

H. Provide a movable containment sock for the Sodium Hydroxide Tote Storage Area as shown on the drawings. Sock shall be suitable for absorbing 30% sodium hydroxide.

2.7 CONTROLS

A. The controls for the Chemical Feed Pumps will be furnished by the Process Control System Supplier. Refer to Section 25 50 50 *Description of Operation* for a description of the controls.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install chemical feed equipment as indicated on the Contract Drawings and in accordance with the manufacturer's instructions and approved shop drawings.

B. Provide and connect piping, accessories, power and control conduit and wiring as required to ensure a complete operable system as intended.

C. Install a minimum of two layers of 30 lb. roofing felt beneath the Micro-C storage tank in accordance with the manufacturer's requirements.

D. Obtain and provide the Owner with an Installation Certificate from the equipment manufacturer's representative attesting that the equipment has been properly installed and is ready for start-up and performance testing.

3.2 START-UP AND PERFORMANCE TESTING

A. Pump Calibration
   1. Determine the calibration curves for each chemical feed pumping unit by plotting capacity versus four different stroke settings between 0 and 100% at 25% increments.
   2. Compute the capacities by measuring the time to empty a calibration column filled with water.

B. Valve Settings: Demonstrate that each chemical feed pump's backpressure and pressure relief valves are properly set.

C. Operate each system on clear water for a continuous period of four hours, under the supervision of the manufacturer's representative and in the presence of the Engineer; demonstrate all system control functions and alarms.

D. Hydrostatically test the system piping for leaks at 100 psig according to Section 40 23 21, *Testing Piping Systems*.

E. Tank Testing
   1. Hydrostatically test the Micro-C storage tank by filling with water to the overflow pipe level.
   2. Check for proper operation of the liquid level indicator.
   3. The water shall be left in the tank at the full level for a minimum of 48 hours.

F. Micro-C Piping
   1. Refer to Section 40 23 19

2. Feed points include SBR No's 1 & 2.
3. Above ground exterior piping shall be heat traced and insulated where necessary to prevent freezing.

G. Sodium Hydroxide Piping
1. Refer to Section 40 23 19
2. Feed point is the Pre-Anoxic Tank as shown on the Contract Drawings.
3. Above ground exterior piping shall be heat traced and insulated where necessary to prevent freezing.

3.3 EQUIPMENT ACCEPTANCE

A. Adjust, repair, modify or replace any components of the system which fail to perform as specified and rerun the tests.

B. System modifications will be subject to approval by the Engineer.

C. Make final adjustments to the equipment under the direction of the manufacturer's representative and to the satisfaction of the Engineer.

END OF SECTION 44 42 56

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SECTION 44 42 75

SUBMERSIBLE INFLUENT CHOPPER PUMPS

PART 1 GENERAL

1.1 SUMMARY

A. This section includes requirements for furnishing and installing new submersible chopper pumps, guide pipes, brackets and appurtenances in accordance with the contract requirements.

B. Influent chopper pumps to be installed at the:
   1. Influent Pump Station (IPS) wet well
   2. Influent Equalization Box at the Pre-Anoxic Tank

C. Intended purpose: The IPS pumps shall be used for conveying ballasted activated sludge (containing magnetite) and raw wastewater with total suspended solids concentrations up to 6,350 mg/l (including magnetite) from the IPS wet well to the SBRs. The Influent Equalization pumps shall be used for conveying raw wastewater to the influent equalization tank when and SBR reaches an intermediate high level during the fill cycle. The pumps shall be chopper-type pumps meant for handling raw municipal wastewater and typical debris found therein.

1.2 SUBMITTALS

A. Layout drawings

B. General arrangement drawings, installation drawings, installation instructions, electrical schematics, wiring and control diagrams, shop drawings, data sheets, catalog cuts, and other such information shall be furnished for review and approval on all equipment and material specified within. Show complete information concerning materials of construction, fabrication, protective coatings, installation, anchoring and layout requirements, fasteners, and other details.

C. Manufacturer's installation recommendations.

D. The manufacturer shall furnish Operation and Maintenance manuals for all of the equipment specified.

E. Before shipment, submit certified pump performance curves showing head/capacity relationships and required horsepower after pump assembly has been fabricated and performance tested, in accordance with Hydraulic Institute latest standards, at the factory for each pump provided

F. Certification of Installation

G. Motor dimensions, performance data and wiring diagrams and cut sheets for all accessories

H. Equipment Certification

At the time of submitting shop drawings, submit the equipment manufacturer's warranty and certification for the Influent Chopper Pumps attesting that the manufacturer has examined the Contract Drawings and Specifications and that the equipment provided will meet the performance criteria and conforms to specification requirements.

1.3 QUALITY ASSURANCE

A. The manufacturer shall perform the following inspections and tests on each pump before shipment:
   1. An insulation test of the windings.
   2. A balancing of the motor (rotor).
   3. A test of the pump motor (run dry for 5 minutes at full load) to verify electrical data measurements. All electrical data shall be registered as part of documentation.
   4. A hydrostatic test of the assembled pump where the casing is under hydrostatic head of 75 psi or 150% of rated shutoff head, whichever is greater.
   5. A motor and cable insulation test for moisture content and insulation defects.
   6. A dry run test to verify correct rotation and mechanical integrity. The entire unit is checked for vibration.
   7. A final inspection of propeller, motor rating, and electrical connections for compliance with purchase order.

EQUIPMENT GUARANTEE CERTIFICATION FORM

Reference: **"SMITHSBURG WWTP ENR UPGRADE AND EXPANSION"**

THE UNDERSIGNED HEREBY ATTESTS THAT HE/SHE HAS EXAMINED THE REFERENCED PROJECT DRAWINGS AND SPECIFICATIONS SECTION **44 42 75** AND CERTIFIES THAT THE **"SUBMERSIBLE INFLUENT CHOPPER PUMPS"** THAT HE/SHE PROPOSES TO FURNISH AND DELIVER MEETS OR EXCEEDS CONTRACT SPECIFICATIONS, IS SUITABLE FOR THE INTENDED PURPOSE STATED IN SPECIFICATIONS SECTION **44 42 75**, IS SUITABLE FOR INSTALLATION AS PRESENTED IN THE ABOVE PROJECT DRAWINGS AND SPECIFICATIONS, AND WILL PROVIDE SATISFACTORY PERFORMANCE AT THE DESIGN CRITERIA SPECIFIED. THIS GUARANTEE OF SUITABILITY FOR INTENDED PURPOSE IS IN ADDITION TO AND SHALL NOT BE IN LIEU OF ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED.

EQUIPMENT: **" SUBMERSIBLE INFLUENT CHOPPER PUMPS"**

MANUFACTURER: _____

Address: _____

_____

By: _____
(Typed Name and Title)

_____/s/_____ (SEAL)
(Signature) (Date)

Equipment Guarantee Certification must be signed by a Principal Person (President, Vice-President, etc.) of the equipment manufacturer. In the event the manufacturer is not the Supplier then a Principal Person of the Supplier must <u>also</u> sign this form.

SUPPLIER: _____

Address: _____

By: _____
(Typed Name and Title)

(SEAL)

_____/s/_____

PART 2 PRODUCTS

2.1 GENERAL

A. The pumps shall be manufactured by:
   1. Vaughan, submersible chopper pump (model numbers provided below)
   2. Or Equal.

B. Pump units shall be approved according to UL standards.

C. All parts shall be designed and proportioned for ample strength and stability for their intended purposes.

D. Pumps shall be designed for continuous-duty.

E. Pump selection shall be based on low energy consumption criteria.

F. Pump installation appurtenances shall permit safe and easy handling of the pumping equipment.

G. Variable frequency drives shall be used to control pump speed.

2.2 OPERATING CONDITIONS

Influent Pump Station Pumps:

Tank Type	**IPS Wet Well**
Number of Tanks	1
No. of Pumps in each tank	2
Total Number of Pumps	2
Design Flow Rate (Max.)	1792 gpm (each pump)
Design Total Dynamic Head (at max. flow)	61.4 feet
Design Flow Rate (Avg.)	850 gpm (each pump)
Design Total Dynamic Head (at avg. flow)	36 feet
Type of Liquid	Raw Wastewater + Ballasted Mixed Liquor
Wet well active volume	3,230 gallons
Electrical Service	460 V / 3 Ph / 60 Hz
Model	S6U-460V-105

Influent Equalization Pumps:

Tank Type	**Influent Equalization Box**
Number of Tanks	1
No. of Pumps in each tank	2
Total Number of Pumps	2
Design Flow Rate (Max.)	1180 gpm (each pump)
Design Total Dynamic Head (at max. flow)	30.5 feet
Design Flow Rate (Avg.)	550 gpm (each pump)
Design Total Dynamic Head (at avg. flow)	21 feet
Type of Liquid	Raw Wastewater
Wet well active volume	5,000 gallons
Electrical Service	460 V / 3 Ph / 60 Hz
Model	S6U-460V-109

Provide sufficient quantity of lubricants to perform the first manufacturer's recommended oil change for all installed pumps.

2.3 PUMP DESIGN DATA

Influent Pump Station Pumps:

A. Motor Size: 50 HP

B. Power Supply: 3 phase /460 volts /60 hertz

C. Propeller Speed: 1340-1800 RPM

D. Discharge Diameter: 6"

E. Impeller/Cutter Bar Material: cast steel

Influent Equalization Pumps:

A. Motor Size: 20 HP

B. Power Supply: 3 phase /460 volts /60 hertz

C. Propeller Speed: 1170 RPM

D. Discharge Diameter: 6"

E. Impeller/Cutter Bar Material: cast steel

2.4 PUMP

A. Each pump shall be of the direct drive, submersible type. All components of the pump, including the motor, shall provide continuous underwater operation while the propeller blades are completely submerged.

B. The pump shall be capable of handling typical domestic or industrial raw, screened sewage with normal concentrations of rags, strings, and sand/grit. The pump shall be designed to be easily raised, lowered,

and handled for lubrication without personnel having to enter the tank. A suspension bracket and sliding console shall be an integral part of the pump unit. The entire weight of the pumping unit shall be guided by the guide bracket, which shall handle all thrust created by the pump. The pump, with its appurtenances and cable, shall be capable of continuous submergence under water without loss of watertight integrity to a depth of 50 ft.

C. Major pump components shall be of 304 stainless steel or ASTM 316 construction. All exposed nuts and bolts shall be of stainless steel.

D. All metal surfaces coming into contact with the pumped media, other than stainless steel, shall be protected by a factory applied powder coating of a polyester resin paint or Ceram C0 coating.

2.5 SUBMERSIBLE MOTOR

A. The submersible motor shall be U/L or FM listed and suitable for Class 1, Group C & D, Division 1 hazardous locations, 1.0 service on VFD power with Class F installation. Motor shall have tandem mechanical seals in oil bath and dual moisture sensing probes. Moisture probes must be connected to indicate water instrusion. The lower motor seal shall be exposed only to the lubricant in the pump bearing housing, with no exposure to the pumped media. Motor shall include two normally closed automatic resetting thermostats connected in series and embedded in adjoining phases. The thermostats must be connected per local, state, and/or the National Electric Code to maintain hazardous location rating and to disable motor starter if overheating occurs. Motor frame shall be cast iron, and all external hardware and shaft shall be stainless steel. Motor shall be sized for non-overloading conditions.

2.6 CASING

A. The casing shall be of volute design, spiraling outward to the Class 125 flanged centerline discharge. Casing shall be ductile cast iron with all water passages to be smooth, and free of blowholes and imperfections for good flow characteristics. Casing shall include a replaceable Rockwell C 60 alloy steel cutter to cut against the rotating impeller pump-out vanes for removing fiber and debris.

2.7 IMPELLER

A. Shall be semi-open type with pump out vanes to reduce seal area pressure. Chopping/maceration of materials shall be accomplished by the action of the cupped and sharpened leading edges of the impeller blades moving across the cutter bar at the intake openings, with a set clearance between the impeller and cutter bar of 0.015-0.025” cold. Impeller shall be cast alloy steel heat treated to minimum Rockwell C 60 and dynamically balanced. The impeller shall be keyed to the shaft and shall have no axial adjustments and no set screws.

2.8 CUTTER BAR PLATE

A. Shall be recessed into the pump casing and shall contain at least 2 shear bars extending diametrically across the intake opening to within 0.010-0.030” of the rotating cutter nut tooth, for the purpose of preventing intake opening blockage and wrapping of debris at the shaft area. Chopper pumping utilizing individually mounted shear bars shall not be acceptable. Cutter bar shall be alloy steel heat-treated to minimum Rockwell C 60.

2.9 CUTTER NUT

A. The impeller shall be secured to the shaft using a cutter nut, designed to cut stringy materials and prevent binding using a raised, rotating cutter tooth. The cutter nut shall be cast alloy steel heat treated to minimum Rockwell C 60.

2.10 UPPER CUTTER

A. Shall be treated into the casing or back pull-out adapter plate behind the impeller, designed to cut against the pump-out vanes and the impeller hub, reducing and removing stringy materials from the mechanical seal area. Upper cutter shall be cast alloy steel heat treated to minimum Rockwell C 60. The upper cutter teeth are positioned as closely as possible to the center of shaft rotation to minimize cutting torque and nuisance motor tripping. The ratio of upper cutter cutting diameter to shaft diameter in the upper cutter area of the pump shall be 3.0 or less.

2.11 PUMP SHAFTING

A. Shafting shall be heat treated alloy steel, with a minimum diameter of 1.5 inches in order to minimize deflection during solids chopping.

2.12 BEARING HOUSING

A. Shall be ductile cast iron, and machined with piloted bearing fits for concentricity of all components. Piloted motor mount shall securely align motor on top of bearing housing.

2.13 THRUST BEARINGS

A. Shaft thrust in both directions shall be taken up by two back-to-back mounted single-row angular contact ball bearings, or a matched set of face to face tapered roller bearings, with a minimum L-10 rated life of 100,000 hours. Overhang from the centerline of the lower thrust bearing to the seal faces shall be a maximum of 1.7”. A third mechanical seal (two in motor) shall also be provided to isolate the bearings from the pumped media. The third seal, as well as the thrust bearings shall be oil bath lubricated in the bearing housing by ISO Grade 46 oil. Shaft overhang exceeding 1.7 inches from the center of the lowest thrust bearing to the seal faces shall be considered unacceptable.

2.14 PUMP MECHANICAL SEAL

A. The mechanical seal shall be located immediately behind the impeller hub to maximize the flushing available from the impeller pump-out vanes. The seal shall be a cartridge-type mechanical seal with Viton O-rings and silicon carbide (or tungsten carbide) faces. This cartridge seal shall be pre-assembled and pre-tested so that no seal settings or adjustments are required from the installer. Any springs used to push the seal faces together must be shielded from the fluid to be pumped. The cartridge shall also include a 17-4PH, heat-treated seal sleeve and a ductile cast iron seal gland.

2.15 SHAFT COUPLING

A. The submersible motor shall be close coupled directly to the pump shaft using a solid sleeve coupling, which is keyed to both the pump and motor shafts. Slip clutches and shear pins between the shaft and the motor are considered unacceptable.

2.16 STAINLESS STEEL NAMEPLATE

A. Shall be attached to the pump giving the manufacturer's model and serial number, rated capacity, head, speed and all pertinent data.

2.17 GUIDE RAIL SYSTEM

A. Provide a non-sparking guide rail system consisting of two galvanized or stainless steel guide rails (by others), cast bronze pump guide bracket, cast ductile iron discharge elbow with mounting feet and Class 125 flanges, 316 stainless steel upper guide rail mounting bracket, and 316 stainless steel intermediate guide rail stiffener bracket every 10 feet. System design shall prevent spark ignition of explosive gases during pump installation and removal.

2.18 SURFACE PREPARATION

A. Sandblast and coat with a minimum 30 MDFT Tnemec Perma-Shield PL series 431 epoxy (except motor).
B. Motor to have standard manufacturer's submersible motor paint finish.

PART 3 EXECUTION

3.1 INSTALLATION

A. Pumps shall be installed in accordance with the manufacturer's recommendations.

B. Following completion of the installation the pump manufacturer shall provide the service of qualified representative to verify proper installation and assist in pump startup.

C. Pump manufacturer shall provide four (4) hours of qualified training and maintenance instruction to the Owner's maintenance personnel.

3.2 FIELD TESTS

A. The field tests shall determine the RPM, and overall efficiency characteristics of each unit and in addition, shall demonstrate that under all conditions of operation each unit:
   1. Has not been damaged by transportation or installation.
   2. Has been properly installed.
   3. Has no mechanical defect.
   4. Is in proper alignment.
   5. Has been properly connected.
   6. Is free of overheating of any parts.
   7. Is free of all-objectionable vibration and noise.
   8. Is free of overloading of any parts.
   9. Motor and cable insulation shall be tested for moisture content or insulation defects.

   A written quality assurance record confirming the above testing/inspections shall be supplied with each pump at the completion of the field test. The equipment manufacturer shall furnish the services of a factory-trained engineer for the above testing.

END OF SECTION 44 42 75

SECTION 44 42 76

POST-EQUALIZATION PUMPS

PART 1 GENERAL

1.1 SUMMARY

A. This section includes requirements for furnishing and installing two (2) new submersible post-equalization pumps in the post-equalization tank in accordance with the contract requirements.

B. The new post-equalization pumps shall be installed using the existing base elbows and rails.

C. Intended Purpose: The Post-Equalization Pumps (Post-EQ) is to convey SBR effluent [decant] from the post-equalization basin through the disc filters and eventually to the UV channel. The Post-EQ pumps serve to covey decanted SBR effluent at an attenuated rate through the filters to avoid overloading the filters.

1.2 SUBMITTALS

A. Layout drawings

B. General arrangement drawings, installation drawings, installation instructions, electrical schematics, wiring and control diagrams, shop drawings, data sheets, catalog cuts, and other such information shall be furnished for review and approval on all equipment and material specified within. Show complete information concerning materials of construction, fabrication, protective coatings, installation, anchoring and layout requirements, fasteners, and other details.

C. Manufacturer's installation recommendations.

D. The manufacturer shall furnish Operation and Maintenance manuals for all of the equipment specified.

E. Before shipment, submit certified pump performance curves showing head/capacity relationships and required horsepower after pump assembly has been fabricated and performance tested, in accordance with Hydraulic Institute latest standards acceptance grade 1U, at the factory for each pump provided

F. Certification of Materials and Installation

G. Motor dimensions, performance data and wiring diagrams and cut sheets for all accessories

H. Equipment Certification
At the time of submitting shop drawings, submit the equipment manufacturer's warranty and certification for the Post-EQ Pumps attesting that the manufacturer has examined the Contract Drawings and Specifications and that the equipment provided will meet the performance criteria and conforms to specification requirements.

1.3 QUALITY ASSURANCE

A. The manufacturer shall perform the following inspections and tests on each pump before shipment:
1. A hydrostatic test of the pump case where the casing is exposed to hydrostatic pressure of 30 ft.

2. A motor and cable insulation test for moisture content and insulation defects.
3. A final inspection of propeller, motor rating, and electrical connections for compliance with purchase order.

The above inspections and tests shall be executed under ISO 9001 certification.

EQUIPMENT GUARANTEE CERTIFICATION FORM

Reference: **"SMITHSBURG WWTP ENR UPGRADE AND EXPANSION"**

THE UNDERSIGNED HEREBY ATTESTS THAT HE/SHE HAS EXAMINED THE REFERENCED PROJECT DRAWINGS AND SPECIFICATIONS SECTION **44 42 76** AND CERTIFIES THAT THE **" POST-EQUALIZATION PUMPS"** THAT HE/SHE PROPOSES TO FURNISH AND DELIVER MEETS OR EXCEEDS CONTRACT SPECIFICATIONS, IS SUITABLE FOR THE INTENDED PURPOSE STATED IN SPECIFICATIONS SECTION **44 42 76**, IS SUITABLE FOR INSTALLATION AS PRESENTED IN THE ABOVE PROJECT DRAWINGS AND SPECIFICATIONS, AND WILL PROVIDE SATISFACTORY PERFORMANCE AT THE DESIGN CRITERIA SPECIFIED. THIS GUARANTEE OF SUITABILITY FOR INTENDED PURPOSE IS IN ADDITION TO AND SHALL NOT BE IN LIEU OF ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED.

EQUIPMENT: **" POST-EQUALIZATION PUMPS"**

MANUFACTURER: _____

Address: _____

_____

By: _____
(Typed Name and Title)

_____/s/_____ (SEAL)
(Signature) (Date)

Equipment Guarantee Certification must be signed by a Principal Person (President, Vice-President, etc.) of the equipment manufacturer. In the event the manufacturer is not the Supplier then a Principal Person of the Supplier must <u>also</u> sign this form.

SUPPLIER: _____

Address: _____

By: _____
(Typed Name and Title)

(SEAL)

_____/s/_____

PART 2 PRODUCTS

2.1 GENERAL

A. The pumps shall be manufactured by:
   1. KSB, submersible pump, Model KRT K 150-400/226XEG-S
   2. Or Equal.

B. Pump units shall be approved according to UL standards.

C. All parts shall be designed and proportioned for ample strength and stability for their intended purposes.

D. Pumps shall be designed for continuous-duty.

E. Pump selection shall be based on low energy consumption criteria.

F. Pump installation appurtenances shall permit safe and easy handling of the pumps.

G. Variable frequency drives shall be used to control pump speed.

2.2 OPERATING CONDITIONS

Tank Type	**Post-Equalization Tank**
Number of Tanks	1
No. of Pumps in each tank	2
Total Number of Pumps	2
Design Flow Rate (Max.)	1615 gpm (each pump)
Design Total Dynamic Head (at max. flow)	43.74 feet
Design Flow Rate (Avg.)	900 gpm (each pump)
Design Total Dynamic Head (at avg. flow)	25.0 feet
Type of Liquid	SBR Effluent
Post-equalization tank active volume	95,300 gallons
Electrical Service	460 V / 3 Ph / 60 Hz

2.3 PUMP DESIGN DATA

A. Motor Size: 30 HP

B. Power Supply: 3 phase /460 volts /60 hertz

C. Propeller Speed: 1176 RPM

D. Discharge Diameter: 6”

2.1 MATERIALS

A. The submersible pump shall be of at minimum, the following grades of materials:

Pump casings:	Grey cast iron EN-GJL-250 (A 48 Class 35B)
Casing wear ring:	Semi austenitic CrNi stainless steel VG 434 (A 890 Grade
Discharge cover:	Grey cast iron EN-GJL-250 (A 48 Class 35B)
Shaft:	Stainless steel EN-1.4021+QT800 (A 276 Type 420)
Shaft Sleeve:	----

Impeller:	Grey cast iron EN-GJL-250 (A 48 Class 35B)
Impeller wear ring:	Semi austenitic CrNi stainless steel VG 434 (A 890 Grade)
Bearing bracket:	Grey cast iron EN-GJL-250 (A 48 Class 35B)
Motor casing:	Grey cast iron EN-GJL-250 (A 48 Class 35B)
Cable sheath:	Waterproof synthetic rubber compound
Elastomer components:	Nitrile rubber (NBR)
Bolts, nuts:	Stainless steel A4 (EN-1.4571) (A 276 Type 316)

2.2 PUMP CONSTRUCTION

A. The pump shall be submersible centrifugal, non-clog, single stage, volute casing, end suction type capable of satisfying the specified performance requirements. The pump shall be designed as "back pull-out" such that the entire rotating assembly can be removed from the casing. The pump shall be suited for continuous operation in a submerged condition driven directly by a full submersible dry squirrel cage induction motor. The impeller shall be fitted directly to the motor shaft.

B. The head-capacity curve shall have a single flow rate for each pumping head valve and have a continuously rising head characteristics from the specified design point to shut-off so as to ensure stability and control in both individual and/or parallel operation. The operating range of the pump as specified, is defined by the maximum and minimum operating heads against which the pump will be required to operate. At no point on the pump's power demand curve between shut-off and the minimum operating head shall be pump's power demand exceed the rated power of the motor.

2.3 CASING

A. The pump shall have a volute casing with centerline discharge. The single piece pump casing shall be made of suitable thickness to allow for long pump life and to safely withstand the pressure at shut off head. The discharge nozzle shall be provided with integrally cast flange. Critical mating surfaces where watertight sealing is required shall be machined and fitted with O-rings. Fittings will be the result of controlled compression of rubber O-rings in two plans and O-ring contact of four sides without the requirement of a specific torque limit.

B. Rectangular cross-sectioned gaskets requiring specific torque limits to achieved compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

2.4 WEAR RINGS

A. The pump shall be provided with replaceable impeller and casing wear rings to insure efficient sealing between the volute and suction inlet of the impeller. It shall be firmly secured to prevent rotation or displacement.

2.5 IMPELLER

A. The impeller shall be of a centrifugal, closed, non-clogging design for high efficiency pumping of industrial and municipal wastewater. It shall have vanes and be capable of handling solids of at minimum 3 inch size, long fibres, sludge and other materials as many normally be found in wastewater. Back vanes shall be provided to minimize axial loads and to propel solids away from the seal area.

B. The impellers lateral cavities shall be of ample size to protect against wet and clogging. The impeller shall be a one piece casting of the material as specified. It shall be smooth, well finished free from blowholes and imperfections, and be dynamically balanced. The impeller shall be securely fitted to the pump shaft in such a manner that it does not loosen or become detached if the pump is operated in the wrong direction as may happen by reversed flow or reversed motor connections.

2.6 PUMP SHAFT

A. The common pump/motor shaft shall be of sufficient size to transmit full driver output with a maximum deflection of 0.05 mm (0.002 inches) measured at the lower mechanical seal. The pump/motor shaft shall be of stainless steel or be completely isolated from the pumped media through the use of a stainless steel shaft sleeve. Do not use carbon steel as a shaft material without using a stainless steel shaft sleeve.

2.7 BEARINGS

A. The shaft shall rotate on a minimum 1 / 1 antifriction bearings. The bearing system shall be adequately designed so as to be capable of handling all axial thrust loads plus any and all radii loads. The bearings shall be sealed and lubricated for lifetime.

2.8 SHAFT SEAL

A. Each pump shall be provided with two totally independent, mechanical seals, installed in tandem, each with its own independent single spring system acting in a common direction. The sealing shall not depend on the direction of rotation.

B. The primary, impeller-side seal shall operate in a large flooded chamber formed by cast recess in the impeller and backplate. The impeller-side seal shall be of bellow type mechanical seal. The primary and the secondary seal faces shall operate in a generously proportioned lubricant chamber that hydrodynamically lubricates the seal faces to allow for extended periods of dry-running operation without the needs for external seal lubrication or cooling systems. The lubricant chamber liquid shall be an environmentally friendly and nontoxic.

C. The seal face material of the primary seal shall be of at minimum Silicon Carbide versus Silicon Carbide (SiC/SiC) for excellent hardness and chemical resistance across the entire “pH” range. The secondary seal shall be of Carbon versus Silicon Carbide (Carbon/Sic). The seal faces may be of a solid material capable of being-relapped. The seals shall require neither routine maintenance nor adjustment, but capable of being easily inspected and replaced.

D. Mechanical seal metal parts shall be of CrNiMo-stainless steel.

E. Seals shall be non-proprietary in design, and shall be available from another vendor in addition the pump manufacturer.

F. Conventionally double mechanical seals with a single or multiple springs acting in opposed direction, cartridge-type mechanical seals; seals with materials other than those specified; shall not be considered as adequate for this critical sealing area.

2.9 BOLTS AND NUTS

A. All nuts and bolts exposed to the pumped media shall be of stainless steel as specified.

2.10 NAMEPLATE

A. Each pump shall be provided with a stainless steel nameplate firmly attached to the pumping unit. It shall be clearly and durable inscribed with the manufacturer's name, year of manufacturer pump-type, serial number, and principal rating data. For each identification of the submerged pumping unit, a second equal nameplate shall be supplied along with its documentation for attachment outside the wet well.

2.11 PROTECTIVE COATING

A. All exterior metal surfaces of the pump shall be subject to following preparation and coating procedure except name plates, bright parts and stainless steel parts.

B. The preparatory temperature of cast and welded components shall be accomplished in accordance with SSPC near white SP 10.

C. The primer when using Zinc dust or Zinc phosphate base shall have a dry film thickness of not less than 1 ½ mils (35 microns).

D. An abrasion and shock-resistant nonporous 2 components epoxy resin base coating shall be used. It shall be resistant against many diluted acids and brines as well as grease, oil, solvents and sweater and especially suited for use in hydrous media. The solids content shall not less than 82%. The shop-applied top coat shall have a dry film thickness of not less than 6 mils (150 microns). The color shall be preferably Ultramarine Blue.

E. Name plates shall be masked or removed prior to surface preparation and coating. Polished and surfaces (shafts, couplings) shall not be painted but preserved against corrosion. The coat of stainless steel parts is not required but acceptable.

2.12 INSTALLATION

A. The pumps shall be installed using the existing base elbows and guide rails.
   1. Existing base elbows dimensions to be field verified by the contractor
   2. Existing guide rail diameter to be field verified by the contractor

2.13 MOTOR

A. The motor shall be three-phase, dry squirrel-cage induction type in design. The motor shall be adequately sized and rated for continuous operation to at maximum a fluid temperature of 104°F (40°C).

B. The motor housing shall be both air filled and watertight. Motor protection shall be at minimum IP 68. Allowable maximum submergence shall be not less than 100 ft. (30m).

C. The motor shall be rated for supply voltage of 460 V and frequency of 60 Hz and accept voltage fluctuations as per range A of IEC 60034-1 (Supply voltage +/- 5% supply frequency +/- 2%). The motor shall be explosion proof to CSA, NEC, FM Class I, Div. 1, Gr. C+D.

D. The motor shall be designed for a maximum of 10 number of starts per hour.

E. The motor stator shall be wound using Class H monomer-free polyester resin insulation resulting in an overall motor rating of 311°F (155°C), Class F. The stator windings shall be Current-UV-Dip-Impregnated resulting in a winding fill factor of at least 90%. The rotor bars and short rings shall be made of cast aluminum.

F. The motor and pump set complete shall be designed and manufactured by the same company.

2.14 ELECTRIC CABLE AND CABLE ENTRY

A. All power and control cables shall be suitable for the flexible connection of the submersible pumps, sized in accordance with NEC, FM, IEC requirements and shall be Ozone, UV, weather, oil and water resistant.

B. The conductors shall be made of finely-stranded copper to Class 5 of IEC 60228. Each conductor shall be insulated by ethylene-propylene-rubber (EPR). An inner sheath of rubber shall also be utilized. The cable outer sheath shall be water and oil-resistant and made of Neoprene. Each cable shall be rated for 600/1000 V and maximum conductor temperature of 194°F (90°C).

C. The power and control cables shall be of 45 ft. length.

D. Each cable entry seal shall be rated for a submerged depth to 100 ft. (30 m).

E. A triple sealed cable entry design along with strain relief and a bend protection shall be provided.

F. Firstly, the cable entry seal shall consist of a elastomer grommet compressed by two stainless steel washers, sealing the outside of the cable against the cable entry casing. Secondly, the entire end of the cable shall be sealed inside the cable entry housing through the use of a non-shrink epoxy resin. Thirdly, a monolithic dam formed by either solder on bare stripped section or by an inserted Copper bushing shall seal each individual cable lead making sure that no entry of moisture is possible into the high-voltage motor terminal area even if the cable is damaged or severed below water level.

G. Cable entries providing only simple rubber grommet (external cable jacket) seals will not be accepted. If a triple sealed cable entry as described is not utilized in the pump's design, then the pump shall have installed a separate moisture sensor mounted in the separated terminal area to shut the pump down should moisture approach the high voltage terminal area.

2.15 MOTOR THERMAL PROTECTION

A. Temperature monitors shall be embedded in the motor windings for use in conjunction with and supplemental to external motor overload protection. These temperature sensitive switches shall allow for direct integration with the motor control circuit to shut down the pump if high temperatures are detected. The switches shall be normally closed rated for 250 V AC and a current of not less than 2 A. The temperature monitors shall automatically reset once motor temperature returns to normal.

2.16 MOTOR HOUSING MOISTURE PROTECTION

A. A moisture detector shall be mounted in the motor's stator cavity allowing a control panel mounted relay to de-energize the motor should leakage occur.

PART 3 EXECUTION

3.1 INSTALLATION

A. Pumps shall be installed in accordance with the manufacturer's recommendations.

B. Following completion of the installation the pump manufacturer shall provide the service of qualified representative to verify proper installation and assist in pump startup.

C. Pump manufacturer shall provide four (4) hours of qualified training and maintenance instruction to the

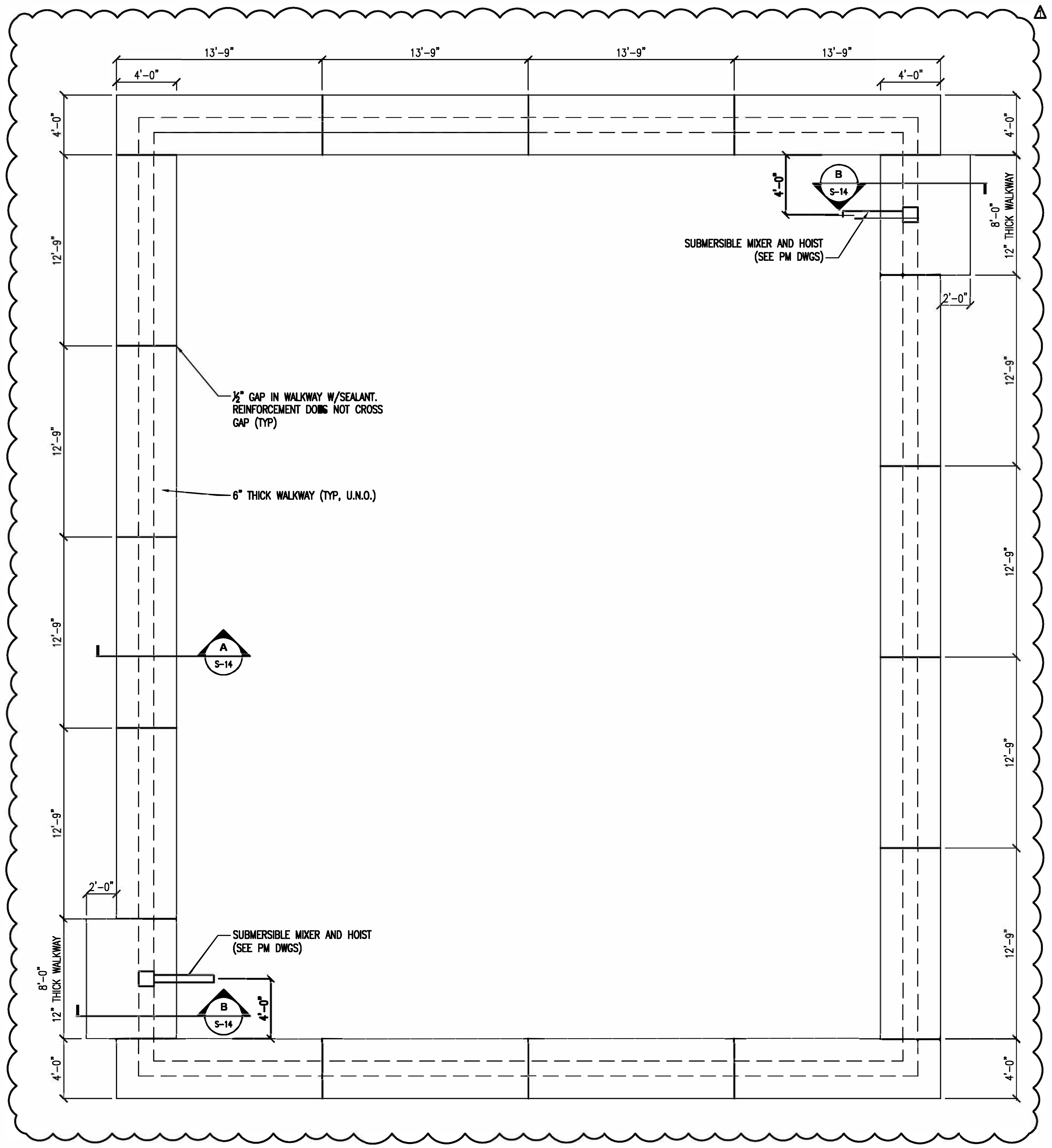
Owner's maintenance personnel.

3.2 FIELD TESTS

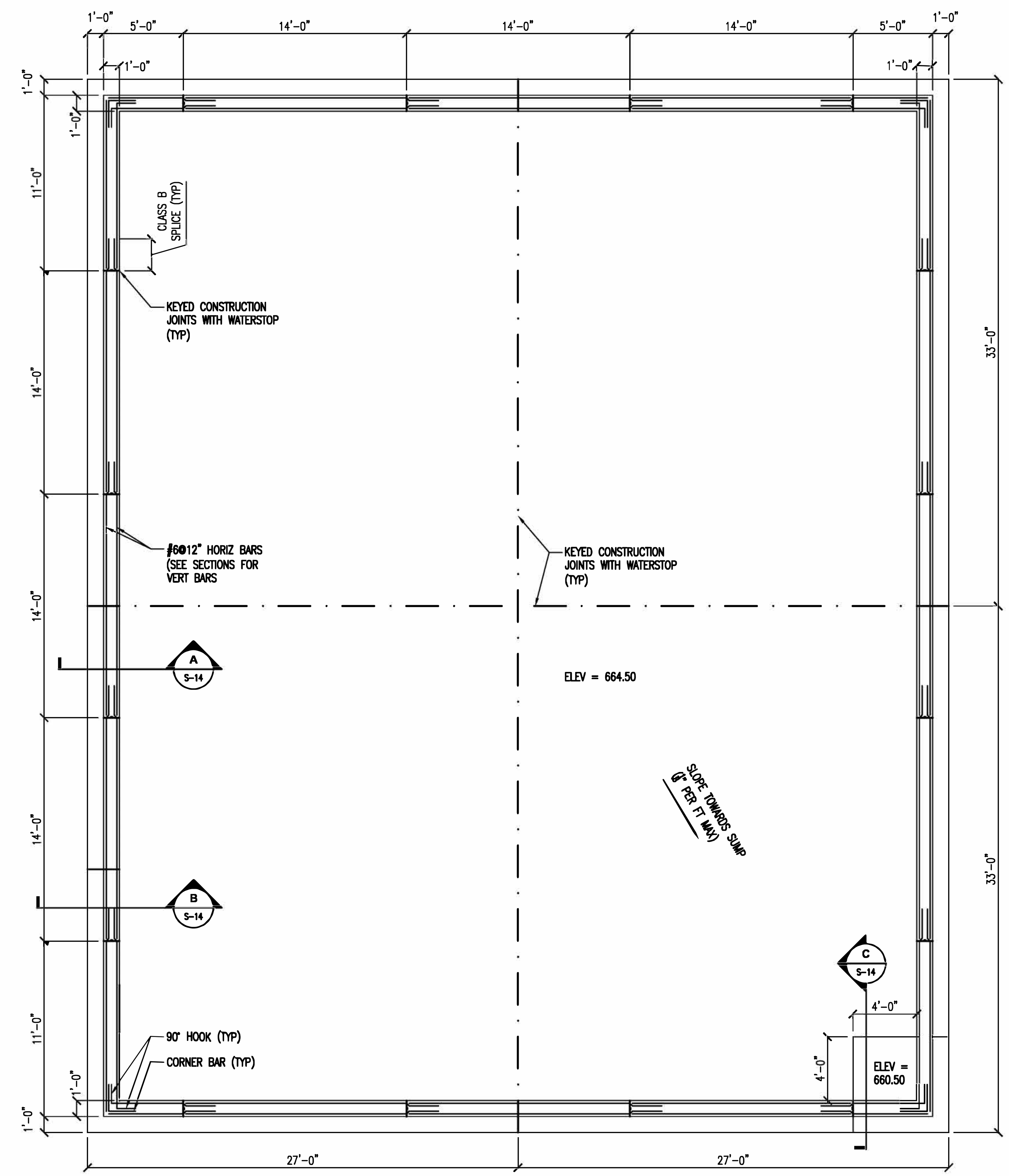
A. The field tests shall determine the RPM, and overall efficiency characteristics of each unit and in addition, shall demonstrate that under all conditions of operation each unit:
   1. Has not been damaged by transportation or installation.
   2. Has been properly installed.
   3. Has no mechanical defect.
   4. Is in proper alignment.
   5. Has been properly connected.
   6. Is free of overheating of any parts.
   7. Is free of all-objectionable vibration and noise.
   8. Is free of overloading of any parts.
   9. Motor and cable insulation shall be tested for moisture content or insulation defects.

   A written quality assurance record confirming the above testing/inspections shall be supplied with each pump at the completion of the field test. The equipment manufacturer shall furnish the services of a factory-trained engineer for the above testing.

END OF SECTION 44 42 76



1 UPPER WALL PLAN
SCALE: 3/16"=1'-0"



1 LOWER WALL/SLAB PLAN
SCALE: 3/16" = 1'-0"

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16232 ELLIOT PARKWAY
WILLIAMSPORT, MARYLAND 21795

REVISIONS

MARK	ISSUED DATE	DESCRIPTION
1	08/31/2023	ADDENDUM #3

PROJECT NO:	76436-03
ISSUED DATE:	08/2021
DRAWN BY:	JTK
CHECKED BY:	JTK

SHEET TITLE:

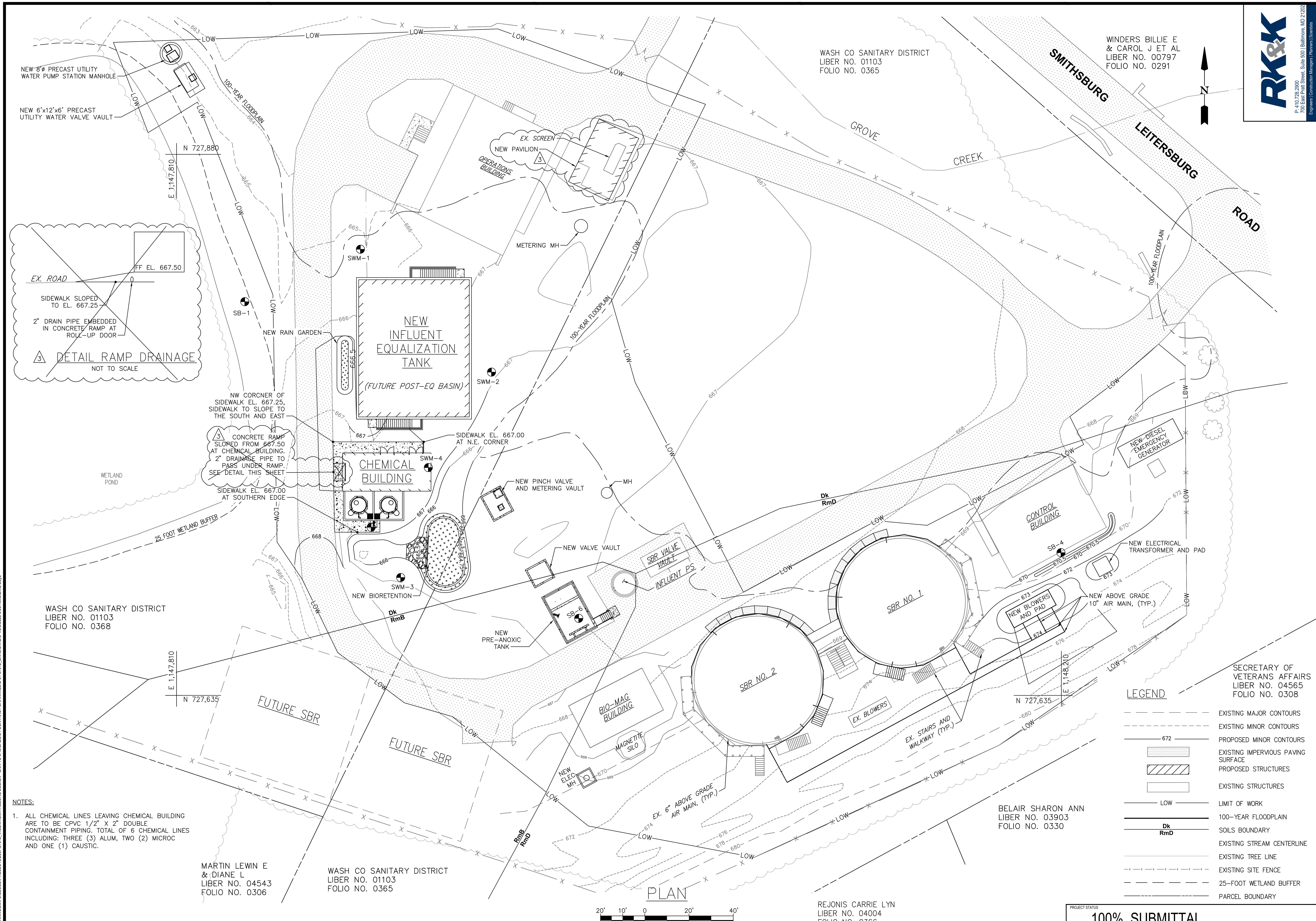
INFLUENT EQUALIZATION TANK PLANS

PROJECT STATUS

100% SUBMITTAL

SHEET NO:

S-13



NOTES:

1. ALL CHEMICAL LINES LEAVING CHEMICAL BUILDING ARE TO BE CPVC 1/2" X 2" DOUBLE CONTAINMENT PIPING. TOTAL OF 6 CHEMICAL LINES INCLUDING: THREE (3) ALUM, TWO (2) MICROC AND ONE (1) CAUSTIC.

LEGEND

- EXISTING MAJOR CONTOURS
- EXISTING MINOR CONTOURS
- 672 — PROPOSED MINOR CONTOURS
- EXISTING IMPERVIOUS PAVING SURFACE
- PROPOSED STRUCTURES
- EXISTING STRUCTURES
- LOW — LIMIT OF WORK
- 100-YEAR FLOODPLAIN
- Dk RmD — SOILS BOUNDARY
- EXISTING STREAM CENTERLINE
- EXISTING TREE LINE
- EXISTING SITE FENCE
- 25-FOOT WETLAND BUFFER
- PARCEL BOUNDARY

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WILLIAMSPORT, MARYLAND 21795

REVISIONS MARK	ISSUED DATE	DESCRIPTION
3	8/2023	DELETE D CONCRETE RAMP AND DETAIL

PROJECT NO:	76436-03
ISSUED DATE:	AUGUST 2022
CO. PROJECT NO:	
DRAWN BY:	ENV DRAFTERS
CHECKED BY:	KCD

SHEET TITLE:

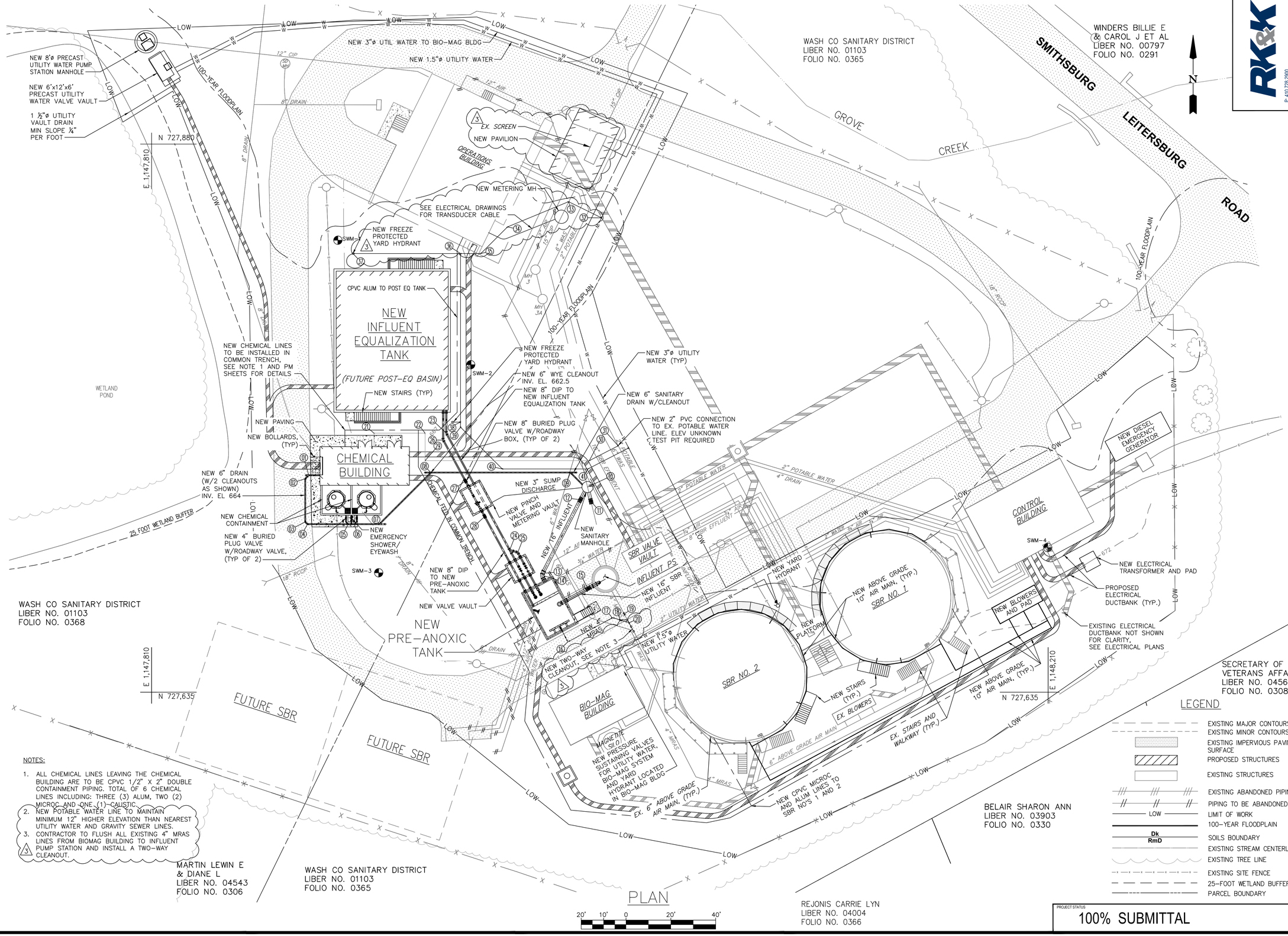
PROPOSED GRADING

PROJECT STATUS

100% SUBMITTAL

SHEET NO:

C-1



NOTES:

1. ALL CHEMICAL LINES LEAVING THE CHEMICAL BUILDING ARE TO BE CPVC 1/2" X 2" DOUBLE CONTAINMENT PIPING. TOTAL OF 6 CHEMICAL LINES INCLUDING: THREE (3) ALUM, TWO (2) MICROC AND ONE (1) CAUSTIC.
2. NEW POTABLE WATER LINE TO MAINTAIN MINIMUM 12" HIGHER ELEVATION THAN NEAREST UTILITY WATER AND GRAVITY SEWER LINES.
3. CONTRACTOR TO FLUSH ALL EXISTING 4" MRAS LINES FROM BIOMAG BUILDING TO INFLUENT PUMP STATION AND INSTALL A TWO-WAY CLEANOUT.

PLAN

20' 10' 0 20' 40'

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REVISIONS		
MARK	ISSUED DATE	DESCRIPTION

PROJECT NO:	76436-03
ISSUED DATE:	AUGUST 2022
CO. PROJECT NO:	
DRAWN BY:	ENV DRAFTERS
CHECKED BY:	KCD

SHEET TITLE:

YARD PIPING PLAN STRUCTURES

PROJECT STATUS

100% SUBMITTAL

SHEET NO:

C-2

NEW 2" PVC CONN. TO EX. POTABLE WATER LINE

NO.	DESCRIPTION	COORDINATES	
21	2" 90° HORIZ. BEND	N 727,751.03	E 1,147,909.23
22	2" 90° HORIZ. BEND	N 727,751.02	E 1,147,932.03
29	2" 90° HORIZ. BEND	N 727,738.75	E 1,147,932.03
30	2" 22.5° HORIZ. BEND	N 727,738.75	E 1,148,005.30
31	3"x2" TEE CONNECTION	N 727,745.41	E 1,148,018.20

NEW 2" PVC CONN. TO NEW 3" UTILITY WATER LINE

NO.	DESCRIPTION	COORDINATES	
32	3"x2" TEE CONNECTION	N 727,847.08	E 1,148,010.74
33	2" 45° HORIZ. BEND	N 727,847.08	E 1,148,010.74
34	2" 22.5° HORIZ. BEND	N 727,843.02	E 1,147,968.77
35	2" 45° HORIZ. BEND	N 727,831.15	E 1,147,956.90
36	2"x2" TEE	N 727,831.15	E 1,147,947.84
37	YARD HYDRANT	N 727,831.15	E 1,147,899.83
38	2"x2" TEE	N 727,755.97	E 1,147,947.84
39	2" 45° HORIZ. BEND	N 727,753.69	E 1,147,947.84
40	2" 45° HORIZ. BEND	N 727,735.05	E 1,147,966.48
41	2" 22.5° HORIZ. BEND	N 727,735.05	E 1,148,004.67

3

4" MRAS AT PRE-ANOXIC

NO.	DESCRIPTION	COORDINATES	
16	4" 90° HORIZ. BEND	N 727,657.89	E 1,147,995.72
17	4" 45° HORIZ. BEND	N 727,668.73	E 1,148,015.72
18	4" PLUG VALVE	N 727,667.65	E 1,148,019.31
19	4" PLUG VALVE	N 727,670.39	E 1,148,020.84
20	4" WYE ON EX. 4" MRAS	N 727,666.58	E 1,148,022.90

6" DRAIN

NO.	DESCRIPTION	COORDINATES	
01	6" 45° WYE CLEANOUT	N 727,732.25	E 1,147,880.09
02	6" 45° HORIZ. BEND	N 727,730.69	E 1,147,878.54
03	6" 45° HORIZ. BEND	N 727,711.44	E 1,147,878.54
04	6" 45° HORIZ. BEND	N 727,710.45	E 1,147,879.57
05	4" X 6" WYE	N 727,710.45	E 1,147,897.72
06	4" X 6" WYE	N 727,710.45	E 1,147,900.47
07	6" 45° WYE CLEANOUT	N 727,710.45	E 1,147,934.65
08	6" 45° WYE CLEANOUT	N 727,733.45	E 1,147,911.64
09	6" 45° WYE CLEANOUT	N 727,733.45	E 1,147,996.86

NEW 8" TO NEW INFLUENT EQUALIZATION TANK

NO.	DESCRIPTION	COORDINATES	
23	8" 11.25° HORIZ. BEND	N 727,750.98	E 1,147,941.50
24	8" WYE	N 727,698.87	E 1,147,969.79
25	8" 45° HORIZ. BEND	N 727,697.82	E 1,147,973.39

NEW 8" FROM INFLUENT EQUALIZATION TO PRE-ANOXIC TANK

NO.	DESCRIPTION	COORDINATES	
26	8" 11.25° HORIZ. BEND	N 727,478.01	E 1,147,940.09
27	8" PLUG VALVE	N 727,729.68	E 1,147,950.04
28	8" PLUG VALVE	N 727,713.93	E 1,147,958.58

16" INFLUENT

NO.	DESCRIPTION	COORDINATES	
11	16" PLUG VALVE	N 727,720.64	E 1,148,006.00
12	16" PLUG VALVE	N 727,721.29	E 1,148,001.33
13	16" 11.25° HORIZ. BEND	N 727,688.61	E 1,147,984.51
14	16" 45° HORIZ. BEND	N 727,687.33	E 1,147,984.14

16" SBR INFLUENT

NO.	DESCRIPTION	COORDINATES	
15	16" PLUG VALVE	N 727,681.73	E 1,148,004.82

NEW PRE-ANOXIC TANK

DESCRIPTION	COORDINATES	
NW CNR PRE-ANOXIC TANK	N 727,678.32	E 1,147,974.54
NE CNR PRE-ANOXIC TANK	N 727,685.92	E 1,147,988.54

NEW INFLUENT EQUALIZATION BASIN

DESCRIPTION	COORDINATES	
NW CNR EQUALIZATION BASIN	N 727,823.34	E 1,147,886.67
NE CNR EQUALIZATION BASIN	N 727,823.34	E 1,147,936.67

NEW CHEMICAL BLDG

DESCRIPTION	COORDINATES	
NW CNR OF CHEMICAL BLDG	N 727,751.34	E 1,147,919.17
NE CNR OF CHEMICAL BLDG	N 727,751.34	E 1,147,904.17

NEW BLOWER PAD

DESCRIPTION	COORDINATES	
NW CNR OF STRUCTURE	N 727,673.00	E 1,147,890.60
NE CNR OF STRUCTURE	N 727,683.33	E 1,148,203.87

NEW GENERATOR PAD

DESCRIPTION	COORDINATES	
NW CNR OF STRUCTURE	N 727,747.32	E 1,148,235.36
NE CNR OF STRUCTURE	N 727,760.60	E 1,148,260.30

NEW TRANSFORMER PAD

DESCRIPTION	COORDINATES	
NW CNR OF STRUCTURE	N 727,695.19	E 1,148,223.96
NE CNR OF STRUCTURE	N 727,698.50	E 1,148,230.12

NEW PAVILION

DESCRIPTION	COORDINATES	
NE CNR OF STRUCTURE	N 727,896.00	E 1,148,001.05
NW CNR OF STRUCTURE	N 727,867.71	E 1,147,987.20

NEW WATER UTILITY VAULT

DESCRIPTION	COORDINATES	
NE CNR OF STRUCTURE	N 727,921.76	E 1,147,815.50
NW CNR OF STRUCTURE	N 727,917.54	E 1,147,808.70

NEW UTILITY WATER PUMP STATION

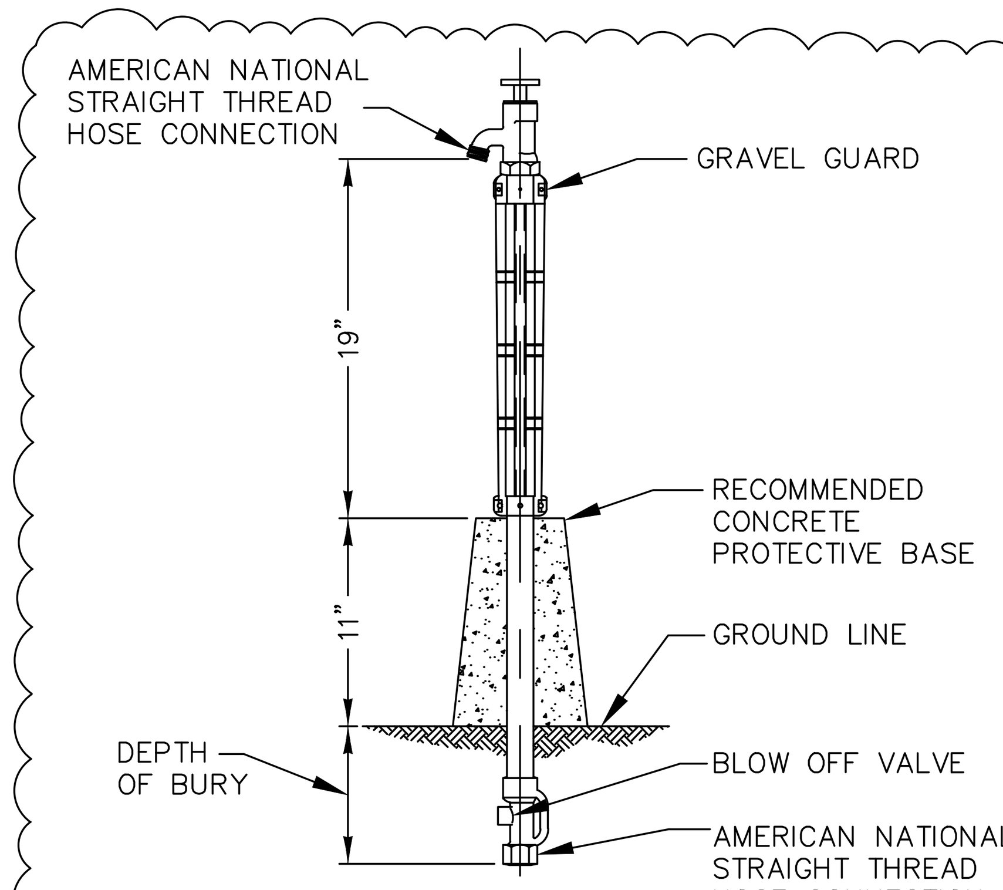
DESCRIPTION	COORDINATES	
CNR OF STRUCTURE	N 727,925.63	E 1,147,807.50

3

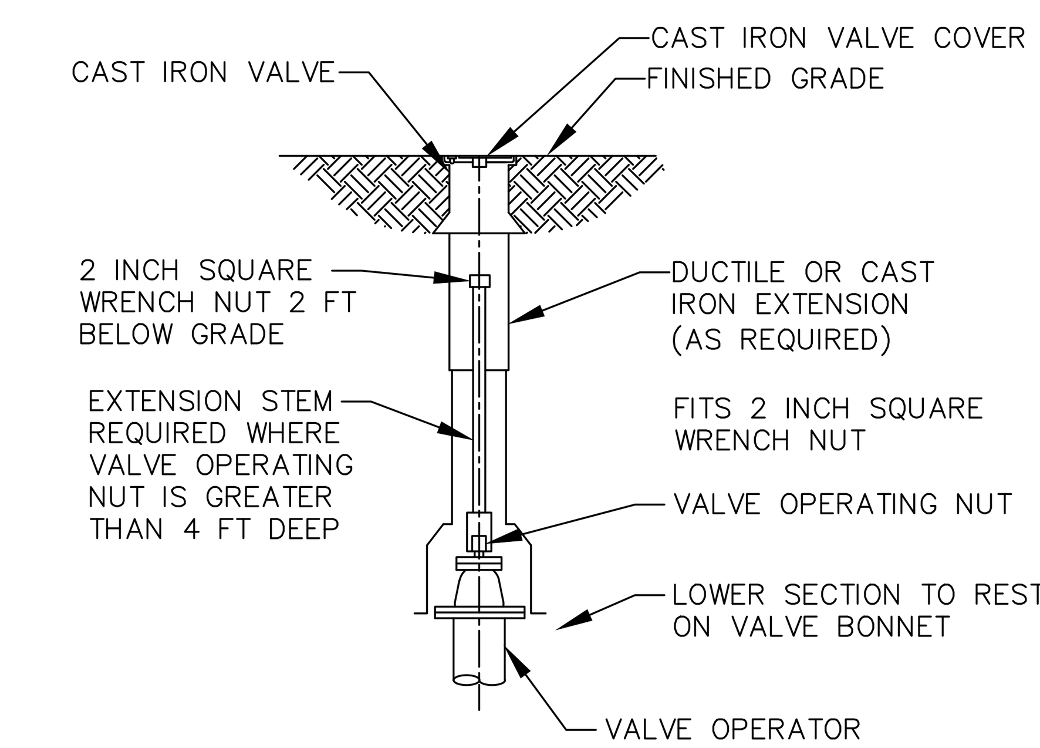
NEW METERING MANHOLE

NO.	DESCRIPTION	COORDINATES	
10	CNR OF STRUCTURE	N 727,726.39	E 1,148,003.90

3



1 C-2 YARD HYDRANT DETAIL
NOT TO SCALE



2 C-2 TYPICAL ROADWAY VALVE BOX DETAIL
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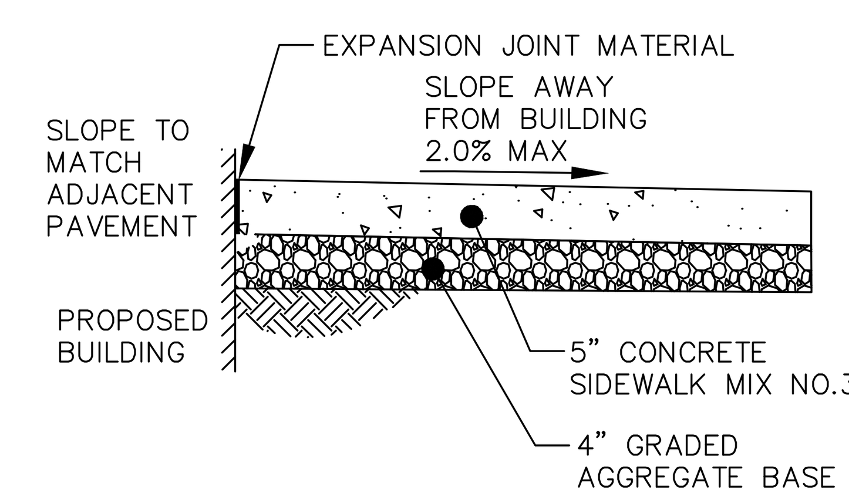

3 C-2 SIDEWALK DETAIL
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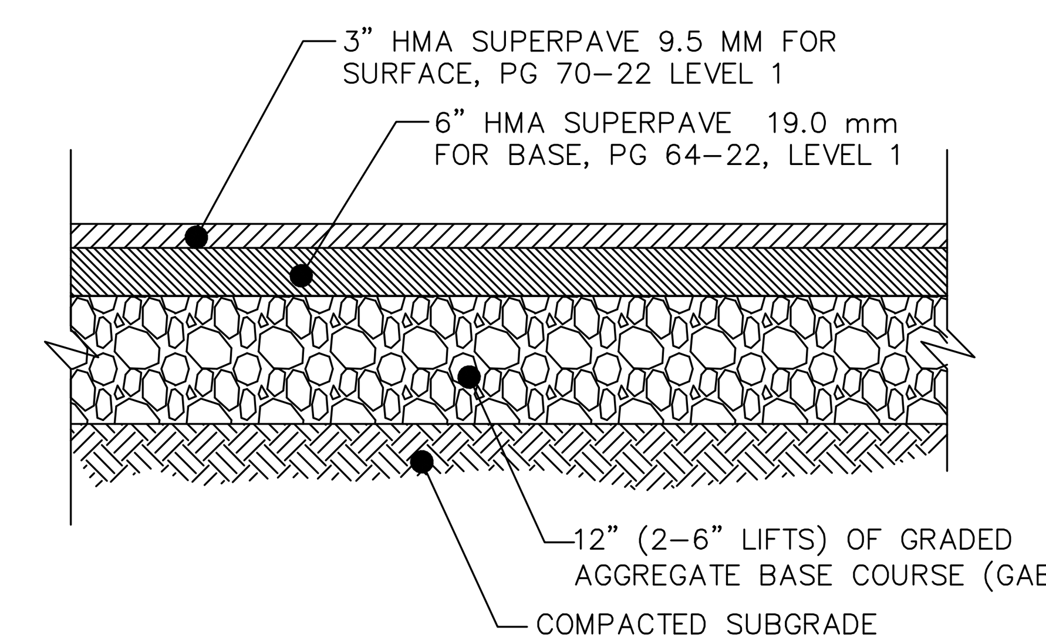
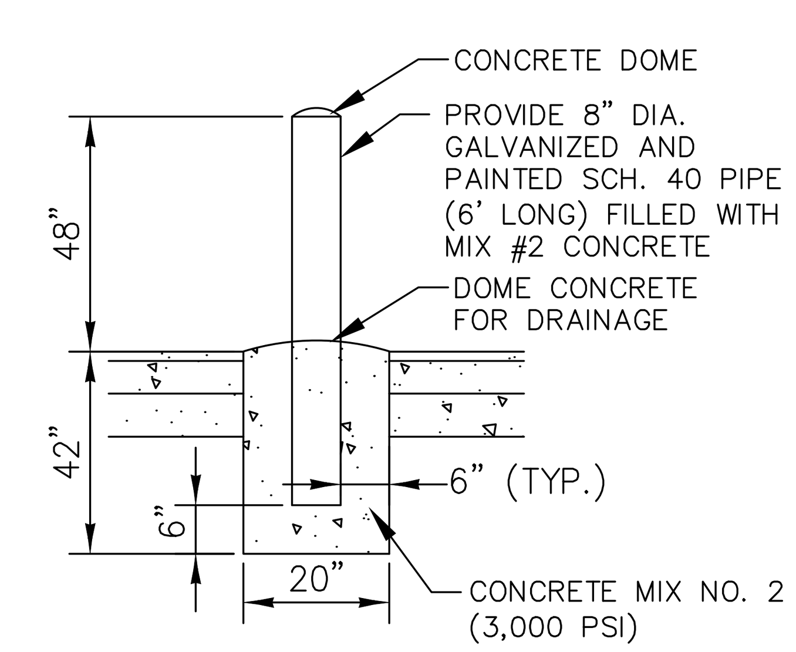
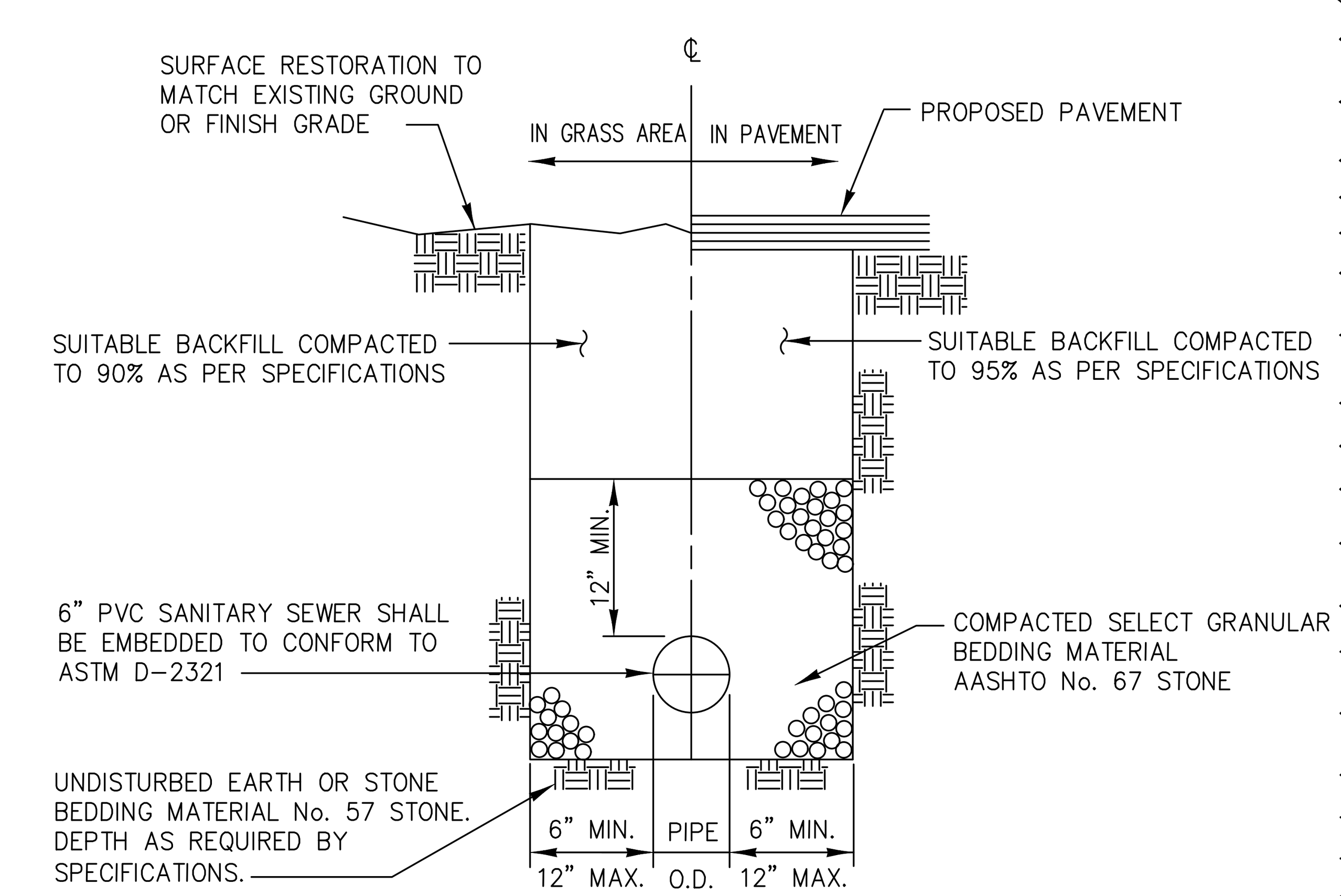


4 C-2 FULL DEPTH PAVEMENT DETAIL
NOT TO SCALE



5 C-2 BOLLARD DETAIL
NOT TO SCALE



NOTE:
ALL TRENCH EXCAVATION SHALL CONFORM TO THE APPLICABLE FEDERAL, STATE AND LOCAL SAFETY REGULATIONS.

3

6 C-2 TYPICAL TRENCH DETAIL
NOT TO SCALE

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16232 ELLIOTT PARKWAY
WILLIAMSPORT, MARYLAND 21795

REVISIONS

MARK	ISSUED DATE	DESCRIPTION
3	8/2023	ADDED DETAIL

PROJECT NO:	76436-03
ISSUED DATE:	AUGUST 2022
CO. PROJECT NO:	
DRAWN BY:	ENV DRAFTERS
CHECKED BY:	KCD

SHEET TITLE:
STRUCTURE AND YARD PIPING STAKE OUT DATA AND CIVIL DETAILS

PROJECT STATUS
100% SUBMITTAL

SHEET NO.
C-3

PUR-1623
Plan Holder's List

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Plan Holder's List

Company Name	Contact Name	Contact Title	Physical Address	Phone	Email
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Plan Holder's List

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PUR-1623
Plan Holder's List

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PUR-1623
Plan Holder's List

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Unlimited Detailing	Amy Kim	Office Manager	Rockville, MD 20851 US	(301) 525-1034	amykim208@gmail.com

PUR-1623
Plan Holder's List

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