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FROM: Jerry Hightower, P.E.

DATE: June 20, 2025

PROJ. NO.: C24038

SUBJECT: Addendum No. 1
Duck River Utility Commission
Contract 2- Water Treatment Plant Improvements

PAGES: 38 pages to follow

PLEASE RESPOND ➔ ➔ ➔ ➔	**TO CONFIRM RECEIPT OF THIS ADDENDUM NO. 1** **PLEASE SIGN AND EMAIL TO CTI** **vvisco@ctiengr.com** **Company** ____________________ **Signature** ____________________ **Title** ____________________ **Date** ____________________

ID 858902

ADDENDUM NO. 1

CONTRACT DOCUMENTS, SPECIFICATIONS, AND DRAWINGS FOR THE DUCK RIVER UTILITY COMMISSION CONTRACT 2: WATER TREATMENT PLANT IMPROVEMENTS

The following changes shall be made to the Contract Documents, Specifications, and Drawings.

I. CONTRACT DOCUMENTS

A. ***Section 00 01 10 – Table of Contents.***

1. Page 00 01 10-3, DELETE 28 21 13 Video Surveillance System in its entirety.

2. Page 00 01 10-4, ADD “46 41 40 Vertical Shaft Flocculators” to Division 46.

B. ***Section 00 11 00 – Advertisement for Bids*.** Page 00 11 00-1, DELETE the bid date of “Wednesday, June 25th” and REPLACE with “Tuesday, July 1st”.

C. **Section 00 21 00 - *Information for Bidders*.** Page 00 21 00-3, Paragraph 9, Time for Completion and Liquidated Damages, DELETE “365 consecutive calendar days” and REPLACE with “426 consecutive calendar days.”

D. ***Section 00 41 00 – Bid.*** Page 00 41 00-1, last sentence, DELETE “365 consecutive calendar days” and REPLACE with “426 consecutive calendar days.”

E. ***Section 00 42 00 – Bid Schedule.*** DELETE pages 00 41 00-1 through 00 42 00-2 and REPLACE with attached pages 00 42 00-1.1 through 00 42 00-2.1.

F. ***Section 00 43 80 – Bidder Acknowledgment of Contract Time.*** Page 00 43 80-1, first sentence, DELETE “365-day contract time” and REPLACE with “426-day contract time.”

G. ***Section 00 52 00 – Contract.*** Page 00 52 00-1, Paragraph 3. third sentence, DELETE “365 consecutive calendar days” and REPLACE with “426 consecutive calendar days.”

H. ***Section 00 55 00 – Notice to Proceed.*** Page 00 55 00-1, DELETE “365 consecutive calendar days” and REPLACE with “426 consecutive calendar days.”

II. SPECIFICATIONS

A. ***Section 01 11 00 – Summary of Work.***

1. DELETE Pages 01 11 00-1 and 2 and REPLACE with 01 11 00-1.1 and 1.2.

B. ***Section 03 30 00 – Cast-in-Place.***

1. Page 03 30 00-4 paragraph 2.3 F 7. Waterproofing Admix: Penetron products equal to the Xypex products are acceptable.

C. ***Section 09 91 00 – Painting.***

1. Page 09 91 00-01, paragraph 1.1B, third sentence, DELETE “3.7” and REPLACE with “3.6”.

2. DELETE Pages 00 91 00 – 17, 18,19, and 20 and REPLACE with pages 00 91 00 – 17.1,18.1, 19.1, and 20.1

D. ***Section 28 21 13 – Video Surveillance System***. DELETE this section in its entirety.

E. ***Section 40 05 13.53 – Ductile Iron Pipe and Fittings***

1. Page 40 05 13.53-6, DELETE paragraph 2.10 A. in its entirety and REPLACE with the following paragraph:

“2.10 NSF COMPLIANCE REQUIREMENTS

A. All products or materials which will contact drinking water must be NSF/ANSI Standard 61 compliant; and all chemicals which will contact drinking water shall be NSF/ANSI Standard 60 compliant.”

F. ***Section 40 05 09.23 – Stainless Steel Sluice Gates.***

1. Page 40 05 09.23-2, DELETE paragraph 1.5 F. and REPLACE with the following paragraph:

“F. Stainless Steel Gates shall be as manufactured by RW Gate, Rodney Hunt, Whipps, or Waterman Valve.”

G. ***Section 40 05 61 – Valves.***

1. Page 40 05 61-5, DELETE paragraph 2.3 L. and REPLACE it with the following:

“L. Butterfly Valves shall be as manufactured by Pratt, or approved equal.”

2. Page 40 05 61-7, DELETE paragraph 2.6 A. and REPLACE with the following paragraph:

“A. General: The Pump Check Valve and Control System shall consist of one rubber seated ball valve, hydraulic actuator, and control system for each ball check valve shown on the drawings and specified herein. The required size of each ball check valve shall be as shown on the drawings. The pump check system shall be the Pratt® Check-Mate system as manufactured by the Henry Pratt Company, or approved equal.

H. ***Section 40 90 00 – Instrumentation and Control General Requirements.***

1. Page 40 90 00-4, DELETE paragraph 1.6, A. DELETE paragraph in its entirety and REPLACE with the following paragraph:

"The Base Bid I&C Integrator shall be Lord & Company, Inc. of Fort Mill, SC; and the alternate bid shall be Inframark (formerly M/R Systems, Inc.) of Norcross, GA."

I. ***Section 46 41 35 – Hyperboloid Flocculators.***

1. Page 46 41 35-3 DELETE Paragraph 1.4 Q
2. Page 46 41 35-4 DELETE Paragraph 1.5 CFD Model and Report in its entirety.
3. Page 46 41 35-5 DELETE Paragraph 2.1 B. 4. D. DELETE 5.0 HP and REPLACE with 3.0 HP

J. ***Section 46 41 40 – Vertical Shaft Turbine Flocculators.*** ADD this Section in its entirety 46 41 40-1 thru 46 41 40-5.
These flocculators are considered an equal and alternative to Section 46 41 35 Hyperboloid Flocculators.

K. ***Section 46 43 76 – Inclined Plate Settler Clarification System.*** DELETE pages 46 43 76-1 thru 46 43 76-14 and REPLACE with 46 43 76-1.1 thru 46 43 76-14.1

L. ***Section 46 61 05 – GAC Contractor Equipment.*** DELETE pages 46 61 05-1 thru 7 and REPLACE with 46 61 05-1.1 thru 1.7

III. DRAWINGS

A. ***DELETE Drawings: M215, M216, M217*** and the work items shown on them related to the existing flocculator and clarifiers.

B. ***Drawing M219: ADD***

1. "Note 5: The 12-inch Mag Meters for all four filters shall be a Promag 400, or approved equal."
2. "Note 6: The 12-icnh Butterfly Valves for all four filters shall be manufactured by Pratt, or approved equal and the electrical actuator for each valve shall be manufactured by Rotork or approved equal."

C. ***ADD Drawing:*** M224.1 "Existing Sludge Pumping Station Pump Replacement" and included work items.

Date: June 20, 2025

Duck River Utility Commission
/s/ Randal J. Braker, P.E.
General Manager

BID SCHEDULE
CONTRACT: 2
WATER TREATMENT PLANT IMPROVEMENTS
DUCK RIVER UTILITY COMMISSION

SCHEDULE I - BASE BID, LUMP SUM

Item No. 1

The Base Bid for furnishing and installing all materials, equipment, labor, and services, except those items specifically identified in these Specifications as being furnished by the Owner, for the construction of the Water Treatment Plant Improvements, Contract 2, complete as shown on the Drawings and specified in the Contract Documents, and including all items of major equipment listed as sub-item (a) or (b) in the following tabulation of Major Equipment Items.

Total Lump Sum of: $____________________

MAJOR EQUIPMENT ITEMS

The Specifications require the inclusion of certain major equipment items by specified manufacturers in the Base Bid. This requirement is not intended to restrict competition but is for the purpose of establishing the desired standard of quality and mechanical features without ruling out comparable competitive equipment.

Where appropriate, provision is made here for the Bidder to offer comparable equipment by other manufacturers for the Owner's consideration.

"a" Items
Equipment listed as "a" items shall be used in the Bidder's Base Bid. These items were used by the Engineer as the basis of design for this project. Bidder shall include a price for all "a" items. Price listed shall include the total installed cost for the bid item, if multiple units (e.g., pumps) are required, the total shall include all installed costs of all units. In the case of multiple "a" items listed for a single equipment item, the Contractor shall circle the "a" item used in his Base Bid. Delivery Time: Bidder shall also list the projected delivery time after approval of shop drawings for each "a" item. If an "a" item manufacturer will not provide a price, bidder shall write "No bid available."

"b" Items
Where such are shown, equipment items listed as "b" items are pre-approved alternates for which the bidder is encouraged to submit prices for supplying those alternate items.

Adjusted Contract Price
The Owner reserves the right to select any, of the proposed "a" or "b" items. The Contract Price shall be equal to the base bid stated above, adjusted by the difference between the Bidder's selected base bid items and the Owner's selections.

This adjusted "Contract Price" shall be the basis for determination of the lowest responsive, responsible bidder.

Specification Section(s)	Equipment	Manufacturer/Supplier	Price $	Delivery Time (Weeks after shop Drawing approval)
26 29 23.21	Variable Frequency Motor Controller (VFD's)	a Altivar Process VFD by Schneider Electric USA, Inc.		
		a Yaskawa P1000 active front end		
		b		
40 90 00	Instrumentation and Control Subcontractor	a Lord & Co.		
		b MR Systems (Inframark)		
46 41 25	Vertical Shaft Turbine Flash Mixer	a Anco		
		a Ebara Sharpe		
46 41 35	Hyperboloid Flocculators	a Invent Environmental Technologies, Inc.		
		b		
46 41 40	Vertical Shaft Turbine Flocculators	a Anco		
		a Ebara Sharpe		
46 43 76	Inclined Plate Settlers and Sludge Collection System Equipment	a MRI		
		b JMS		
46 61 05	GAC Contactor Equipment	a Leopold		
		a Roberts Filter Group		

Notes

1) Bidder shall provide prices and delivery time for all "a" items listed. Failure to do so can be grounds for the Bidder to be declared nonresponsive. If an "a" item manufacturer will not provide a price, bidder shall write "No bid available."

2) The Owner reserves the right to award the project using any combination of the adjusted "Contract Price" as described above.

3) Manufacturers listed under bid items 46 41 35 and 46 41 40 are competing with each other. The total price for all three mixers by one manufacturer is to be included in the base bid.

BIDDER DATE

BY Signature TITLE

ADDRESS

CITY STATE ZIP CODE

TELEPHONE NUMBER FAX E-MAIL

SECTION 01 11 00

SUMMARY OF WORK – CONTRACT 2

PART 1 - GENERAL

1.1 SUMMARY

A. The work described in these Contract Documents consists of furnishing, delivering, and installing all materials, equipment, and products for the construction of DRUC Water Treatment Plant Improvements – Contract 2, as shown on the Drawings or specified herein.

B. Furnish all materials, power, equipment, tools, labor, transportation, and other items necessary or convenient to the Contractor for the installation of the equipment, materials, and products specified or described in these Contract Documents and for the completion of all work to be performed by the Contractor as specified herein.

C. The work includes but is not limited to new structures and equipment, miscellaneous improvements, and equipment replacements, etc.

1. New Flash Mix Basin, Flocculation Basin & Sedimentation Basins Rated for 8 MGD Flow Rate

    a. One (1) Flash Mix Basin with Mechanical Mixer with VFD

    b. One (1) 3-stage flocculation basin with three (3) vertical flocculators with VFD's

    c. Two (2) sedimentation basins with SS plate settlers, sluice gates, and automatic sludge collector systems.

    d. One (1) new sludge pumping station.

    e. Piping includes drains, drain valves, sludge force mains and gravity lines, electrical, controls, etc.

2. Site Improvements

    a. Approximately 15-feet of new 24-inch DIP Raw Water Pipe with insertion type flow meter with concrete box and accessories, electrical service, control wire, and conduit. Connect to existing 24-inch DIP on one end and new Flash Mix on other end. Contractor determine exact length required.

    b. New 24-inch insertion type flow meter with concrete box and accessories, electrical service, control wire, and conduit

    c. New 30-inch DIP Settled Water Pipe, including paving cut and replacement, and concrete slab cut and replacement

    d. Replacement of sludge pump in existing sludge pumping station

    e. Repaved access road at pipeline cuts.

f. New sidewalks and repairing/replacing existing damaged/settled sidewalks and stairs.

3. Conversion of Four Existing Filters from Conventional Filters to GAC Contactors

   a. Remove and discard existing filter media, underdrains, and filter control consoles

   b. Clean all surfaces of filters, including walls, floors, troughs, gullets, flumes, etc.

   c. Furnish and install new filter underdrains

   d. Furnish and install new stainless steel air pipe

   e. Furnish and install new loss of head instruments

   f. Furnish and install new radar level measurement instruments

   g. Furnish and install new rate-of-flow mag meter, butterfly valve, and necessary fittings and spool pieces for four filters

4. WTP SCADA upgrades and improvements, including connection of all new items of equipment and instruments.

1.2 PROJECT COORDINATION

A. The Contractor shall be responsible for project coordination, which includes but is not limited to the following:

   1. Work of employees and subcontractors under contract to him. Conduct work to ensure compliance with schedules.

   2. Submission of all invoices, progress schedules, progress reports, progress estimates, and other data needed in support of requests for payment.

   3. Product and equipment deliveries are adequate to maintain the schedule of construction. Report noncompliance to Owner with a recommendation for remedy.

   4. Obtaining and use of all temporary structures, offices, storage sheds, and utilities.

   5. Obtaining and paying for any required building permits, special permits, and approvals from all authorities having jurisdiction.

   6. Testing laboratory activities associated with Contractor's scope of work.

   7. Check-out of systems and equipment and start-up operations.

   8. Work and operations between the Contractor and all trades in such a manner that no union labor dispute of jurisdiction arises regarding unloading, handling,

PROTECTIVE COATING SCHEDULE											
Item Description	**Generic Type**	**Project Location**	**Surface Preparation**	**First Coat (Primer)**	**DFT Mils**	**Second Coat**	**DFT Mils**	**Third Coat**	**DFT Mils**	**Total DFT Mils (min)**	**Total Coats**
Interior Exposed	Acrylic		Clean and Dry	P-1	2-3	F-1	2-3	F-1	2-3	6	3
Interior Exposed	Epoxy		Clean and Dry	FS-4	1-2	F-5	2-3	F-5	2-3	5	3
Wood											
Interior or	Acrylic		Clean and Dry	F-1	2-3	F-1	2-3	F-1	2-3	6	3
Exterior Exposed	Latex		Clean and Dry	P-2	1.5-2	F-2	1.5-2	F-2	1.5-2	5	3
Interior Exposed	Stain/Varnish		Clean and Dry	P-3	450-550 (ft²/gal)	F-3	1.4-1.7	F-3	1.4-1.7	3	3
Ferrous Metal[1]											
Exterior Exposed[2]	Epoxy/Polyurethane		SSPC-SP6	F-5	3-5	F-5	4-6	F-5	2-3	9	3
Interior Exposed[2]	Epoxy	2	SSPC-SP6	F-5	3-5	F-5	4-6	F-5	4-6	11	3
Immersion	Epoxy	2	SSPC-SP10	F-4[3]	3-5	F-4[3]	4-6	F-4[3]	4-6	11	3
Below Grade & Underground	Coal Tar Epoxy		SSPC-SP10	F-5	3-5	F-10	16-20			20	2
Interior/Exterior Exposed High Temperature[2]	Silicone Aluminum		SSPC-SP10	P-4	2-4	F-19	1-1.5	F-19[9]	1-1.5	5.5	2 or 3
Galvanized Steel, Stainless Steels, and Non-Ferrous Metals											
Exterior Exposed[2]	Epoxy/Polyurethane		SSPC-SP16	F-5	3-5	F-5	4-6	F-6	2-3	9	3
Interior Exposed[2]	Epoxy		SSPC-SP16	F-5	3-5	F-5	4-6	F-5	4-6	11	3
Immersion	Epoxy		SSPC-SP16	F-4[3]	3-5	F-4[3]	4-6	F-4[3]	4-6	11	3
Ductile or Cast Iron											
Exterior Exposed[2]	Epoxy/Polyurethane	1 or 3	NAPF 500-03-04[4]	F-5	3-5	F-5	4-6	F-5	2-3	9	3
Interior Exposed[2]	Epoxy	1 or 3	NAPF 500-03-04[4]	F-5	3-5	F-5	4-6	F-5	4-6	11	3
Immersion	Epoxy	1 or 3	NAPF 500-03-04[4]	F-4[3]	3-5	F-4[3]	4-6	F-4[3]	4-6	11	2
Below Ground	Coal Tar Epoxy		NAPF 500-03-04[4]	P-6	3-5	F-10	16-20			19	3
PVC, Fiberglass											
Exterior Exposed[2]	Epoxy/Polyurethane		Scarify	F-5	2-3	F-6	2-3			4	2
Interior Exposed[2]	Epoxy		Scarify	F-5	2-3	F-5	2-3			4	2
Insulated Pipe											

PROTECTIVE COATING SCHEDULE											
Item Description	**Generic Type**	**Project Location**	**Surface Preparation**	**First Coat (Primer)**	**DFT Mils**	**Second Coat**	**DFT Mils**	**Third Coat**	**DFT Mils**	**Total DFT Mils (min)**	**Total Coats**
Interior Exposed	Acrylic		Clean and Dry	P-1	2-3	F-1	2-3			4	2
Concrete											
Exterior Exposed[8]	Modified Acrylate or Acrylic		SSPC-SP13, CSP 1-3	P-10	.7-1.3	F-12	5-8	F-12	5-8	11	3
Interior Exposed[8]	Acrylic		SSPC-SP13, CSP 1-3	P-1	2-3	F-1	2-3	F-1	2-3	6	3
	Epoxy		SSPC-SP13, CSP 3-5	F-4[3]	4-6	F-4[3]	4-6			8	12
Immersion[8]	Epoxy		SSPC-SP13, CSP 3-5	F-4[3]	4-6	F-4[3]	6-10	F-4[3]	6-10	16	3
Below Grade	Coal Tar Epoxy		SSPC-SP13, CSP 2-4	F-10	16-20					16	1
Secondary Containment[8]	Epoxy		SSPC-SP13, CSP 3-5	P-7	8-12	F-7	8-12			16	2
	Vinyl Ester[1]		SSPC-SP13, CSP 3-5	P-8	15-18	F-8	15-18			30	2
	Vinyl Ester[SW]		SSPC-SP13, CSP 3-5	P-8	3.5-4.5	F-8	15-20	F-8	15-20	33	3
Masonry/CMU											
Exterior Exposed	Water-Based Sealer		Clean and Dry	FS-5	125-175[6] (ft^2/gal)						
	Modified Acrylate or Acrylic		SSPC-SP13, CSP 1-3	P-10	.7-1.3	F-12	5-8	F-12	5-8	11	3
Interior Exposed	Acrylic		SSPC-SP13, CSP 1-3	P-1	2-3	F-1	2-3	F-12	2-3	6	3
	Epoxy		SSPC-SP13, CSP 3-5	FS-3	75-100[6] (ft^2/gal)	F-4[3]	4-6	F-4[3]	4-6	10	3
Concrete Floors											
Interior Exposed	Epoxy/Polyurethane (Light Traffic Only)		SSPC-SP13, CSP 2-4	F-13	3-5	F-13	2-3	F-9	2	7	3
	Epoxy/Polyurethane (Anti-Slip)		SSPC-SP13, CSP 2-4	F-13	3-5	F-14	2-3	F-14[10]	2-3	7	3
	Epoxy (High Solids)		SSPC-SP13, CSP 3-5	P-9	6-8	F-13	6-8	F-17	6-8	20	3
	Aggregate Filled Epoxy		SSPC-SP13, CSP 3-5	P-9	6-8	F-15	1/8" Double Broadcast	F-17	6-8	1/8" +	4
	Ceramic Filled Decorative Epoxy		SSPC-SP13, CSP 3-5	P-9	6-8	F-16	1/8" Double Broadcast	F-18		1/8" +	3

PROTECTIVE COATING SCHEDULE											
Item Description	**Generic Type**	**Project Location**	**Surface Preparation**	**First Coat (Primer)**	**DFT Mils**	**Second Coat**	**DFT Mils**	**Third Coat**	**DFT Mils**	**Total DFT Mils (min)**	**Total Coats**

NOTES:

[1] Field priming of shop-primed ferrous metal surfaces is required only where the shop primer has been removed because of damage or apparent corrosion and the surface has been re-prepared in accordance with Part 3.2, Preparation of Surfaces, of this section.

[2] Where piping is to be striped, 2 full coats of the base color shall be applied prior to the application of the contrasting color of strip.

[3] NSF approved for potable water service.

[4] Provide additional cleaning per NAPF 500-03-01 "Solvent Cleaning" where required.

[5] Exposures subject to aggressive chemical solutions such as inorganic and organic acids, etc.

[6] The spreading rate will depend on the porosity of the surface.

[7] Depending on the method of application and color of the primer or intermediate coat, certain colors may require multiple coats for complete hiding.

[8] Use manufacturer's recommended filler and/or surfacer to fill bug holes and voids flush.

[9] Additional coat depends on operating conditions.

[10] Add non-skid/anti-slip components.

sw

Some film thickness ranges listed are only achievable by spray applications. Roller applications may require additional coats.

3.6 PROJECT PAINTING LOCATION SCHEDULE

A. Following indicates locations of areas, items, etc. to undergo surface preparation and painting:

1. New and/or existing exposed (not buried) ductile iron pipe fittings, and valves in the existing or new sludge pumping stations.
2. New and existing ferrous metal including pipe.
3. New ductile iron pipe, fittings, and valves in the Pipe Gallery for GAC Filters #1 thru #4.

END OF SECTION

SECTION 46 41 40

VERTICAL SHAFT FLOCCULATORS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Contractor shall furnish and install ready for use, three heavy-duty vertical shaft turbine flocculators including all necessary appurtenances for the complete assemblies as indicated on the Drawings and as specified herein.

B. The flocculators shall be complete assemblies including but not limited to the gear reducers, motors, variable frequency drives, shafting, impellers, couplings, mounting bases and other appurtenant equipment necessary to be complete and operable in accordance with the requirements of the Contract Documents.

1.2 REFERENCED STANDARDS

A. AFBMA - Anti-Friction Bearing Manufacturers Association

B. AGMA - American Gear Manufacturers Association

1. AGMA 390.03 - Gear Handbook Volume 1: Gear Classification, Materials and Measuring Methods for Unassembled Gears.

2. AGMA 299.01 - Sound Manual.

3. AGMA 6010.E88 - Spur, Helical, Herringbone and Bevel Enclosed Drives.

C. ANSI - American National Standards Institute

D. ASTM - American Society for Testing and Materials

E. NEMA - National Electrical Manufacturers Association

F. OSHA - Occupational Safety and Health Administration, Code of Federal Regulations (CFR 29)

1.3 QUALITY ASSURANCE

A. Each flocculator shall be completely shop assembled and factory tested to assure proper fit-up, above and acceptable limits the sizes of vibration, shaft run out and motor power draw. The equipment shall then be packaged for shipment and jobsite storage to prevent damage or corrosion.

1.4 SUBMITTALS

A. Submit shop drawings and copies of all materials to establish compliance with the Specifications in accordance with the provisions as outlined. Submittals shall include at least the following:

1. Complete description of all materials.

2. Drawings showing complete dimensional data of the proposed flocculator design including the flocculator outline dimensions, motor and drive, output coupling, and impeller assembly data and mounting details.

3. A complete bill of materials.

4. The weight of each complete flocculator assembly and each component; motor, variable frequency drive unit, gearbox, shafting and impellers.

5. Description of surface preparation, shop priming and finish painting of the flocculators.

6. Flocculator design calculations and process design calculations.

7. Complete motor and variable frequency drive data.

8. Flocculator installation, operation and maintenance information.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit complete operation and maintenance data. The data shall be prepared specifically for this installation and shall include start-up data, trouble shooting guides, routine maintenance procedures, lubrication data, drawings, equipment lists, descriptions, etc. that are required to instruct operating personnel.

1.6 DELIVERY, STORAGE AND HANDLING

A. Ship, store, handle, and install in such a manner as to not degrade quality, serviceability, or appearance. Store equipment in a clean, dry location free from construction dust, precipitation, and excess moisture. If stored for more than two weeks, the equipment shall receive all maintenance considerations required by the manufacturer for proper storage of the equipment.

1.7 TOOLS AND SPARE PARTS

A. Furnish one set of all special tools required for the proper servicing of all equipment supplied under this section.

B. Furnish all spare parts (not including required lubrication) as recommended by the manufacturer for one year normal operation and maintenance of the equipment.

PART 2 - PRODUCTS

2.1 GENERAL

A. The equipment herein specified shall be standard mixing equipment of proven ability as manufactured by reputable concerns having experience in the production of such equipment. The equipment shall be designed, constructed, and installed in accordance with the best practice and methods.

B. All parts shall be so designed and proportioned as to have liberal strength, stability and stiffness and to be especially adapted for the work to be done.

2.2 MANUFACTURERS

A. The flocculators shall be Anco Mixer Series 3000 as manufactured by Enviropax, Inc. of Salt Lake City, Utah; or Ebara-Sharpe Mixers N-Series.

2.3 MATERIALS

A. All submerged parts including the mixer shaft and impeller shall be constructed of Type 316 stainless steel. All fasteners required for assembly of submerged parts shall be Type 316 stainless steel.

2.4 DESIGN CRITERIA

A. Basins

1. Number of Basins	3
2. Width	27'-6"
3. Length	27'-6"
4. Side Water Depth	15'-0"
5. Freeboard	1'-6"

B. Impellers

1. Number of blades, minimum	4
2. Diameter, minimum (inches)	122
3. Speed (rpm), maximum	20

C. Shaft diameter, minimum (inches)	2.50
D. Motor horsepower, minimum	5 HP (Stage 1), 5 HP (Stage 2), 3 HP (Stage 3)
E. Motor speed (rpm), nominal	1800
F. Velocity gradient (sec^{-1})	107 - 60

2.5 DRIVE DESIGN

A. Only drive units specifically designed for agitator service and suitable for 24-hour-per-day operation under moderate to heavy shock loads shall be acceptable. Each drive unit shall consist of an electric motor and a gear reducer with a flexible coupling provided between the motor and gear reducer.

B. Each agitator drive shall consist of a rugged grey cast iron speed reducer. Housing shall be SAE, Class 30. Lifting lugs shall be provided on the speed reducer and motors, above 180TC frame. Motor shall be readily separable from gear reducer.

C. The gear reducer shall be built in accordance with current AGMA standards. The reducer shall be a right angle design with horizontal input shaft and vertical output shaft. Speed reduction shall be accomplished by use of a double or triple reduction gearbox with primary helical gearing and low speed spiral bevel gearing. The maximum ratio for any one gear set shall be 6.2:1. Efficiency shall be no less than 98.5% efficiency per gear mesh. The housing shall be fabricated steel. The housing shall have an enlarged low speed bore to allow for assembly and adjustment of the low speed bevels without disturbing the high-speed gearing.

D. High speed input shaft bearings shall be heavy-duty ball bearings. Intermediate shaft bearings and low speed output shaft bearings shall be tapered roller bearings.

E. All bearings shall have a minimum B-10 rating of 100,000 hours.

F. Gear reducer lubrication shall be of means of an oil bath. All bearings shall be oil lubricated. Low speed output shaft shall be sealed using double quadralip oil seals. Oil drain and fill plugs shall be easily accessible.

G. Gear reducer shall carry a minimum AGMA service factor of 1.50 based on motor nameplate horsepower. Rating is based on electric motor driven speed reducers operating 24 hours per day under moderate to heavy shock load conditions. All drive components shall be designed for outdoor or other environmental conditions, as noted.

2.6 SHAFT DESIGN

A. Agitator shaft shall be designed to withstand all torsional and bending stresses without the use of bottom or intermediate shaft bearings and constructed of 316 stainless steel. Combined shaft stress shall not exceed 8,000 psi based on a material ultimate yield stress of 30,000 psi. Operating speed shall not exceed 70% of first natural lateral critical speed. Shaft shall be straightened to a maximum total indicated runout of 0.003 inch per foot of length.

2.7 IMPELLERS

A. Impellers shall be of the quantity and size specified and constructed of 316 stainless steel. Impellers shall be high efficiency hydrofoil design to produce high volumetric flow rate at low power investment. Impellers shall be four-blade design attached to a central hub. Impeller attachment to shaft shall be by means of a key and keyway or by means of a split and clamped hub arrangement. Method of attachment shall be adequate to transmit 150% of operating torque.

2.8 MOTORS

A. Electric motors shall be NEMA B design, squirrel cage induction type for normal starting torque. Motors shall be the sizes listed in Paragraph 2.4D above. Motors shall be 1800 rpm, horizontal C-flange mounted with TEFC enclosure, energy efficient, chemical duty, 1.15 service factor, and Class F insulation suitable for operation on 3/60/230-460 volt service. Motor shall be connected to gear reducer through a flexible coupling. Coupling shall be rated for 150 percent of operating load. Motors shall be rated for inverter duty. Motor speed shall be capable of being reduced through the use of a variable frequency drive (furnished by others).

2.9 PAINTING

A. All drive components and carbon steel non-wetted parts shall be painted in accordance with agitator manufacturer's standard practice. Paint shall be industrial acrylyd acrylic enamel applied in three coats, one coat of primer and two top coats having a total dry film thickness of 4-5 mils.

PART 3 - EXECUTION

3.1 INSTALLATION OF EQUIPMENT

A. Install in accordance with the manufacturer's written instructions and as approved.

B. Furnish and install mounting frame, supports, hardware, etc., using stainless steel. Shop drawings shall include fabrication details of required items.

3.2 START-UP

A. A competent service representative trained in servicing flocculator units shall be present to supervise the start-up and test runs of all equipment.

B. Test runs shall be made over the full range of operation to demonstrate that the flocculators will operate as designed.

C. All manufacturer's visits to plant prior to start-up shall be the responsibility of the Contractor. The Contractor shall furnish the Owner with services of equipment manufacturer's representative for a period of two man-days.

3.3 INSPECTION AND TESTING

A. After completion of installation, test the equipment under actual operating conditions. The tests shall demonstrate that the system and individual equipment items operate properly, in all respects fulfill their function, and meet all requirements of the Specifications.

END OF SECTION

SECTION 46 43 76

INCLINED PLATE SETTLER CLARIFICATION SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Provide a complete Inclined Plate Clarification System as described herein and shown on the contract drawings consisting of inclined plate settlers, sludge removal equipment, controls, and appurtenances for a complete working system.

B. The Inclined Plate Clarification System shall include:

1. Plate Settlers: Inlet diffusers, inclined plate settlers, effluent collection troughs, support beams, support structures, isolation baffles, mounting brackets, floating plate covers, anchor bolts, fasteners, and related appurtenances.

2. Sludge Removal System: Hoseless sludge collector assembly, sludge exit pipe, electric drive assembly, drive cables, cable pulleys, control system for fully automatic operation, and all other miscellaneous accessories and hardware as required for a complete installation.

3. The Inclined Plate Clarification System equipment shall be provided as an integral package by a single manufacturer regularly engaged in the production of this equipment who shall take responsibility for coordination of all components to assure proper functioning of the clarification equipment as a system.

1.2 REFERENCE STANDARDS

A. NSF Standard 61 – Drinking Water Systems Components - Health Effects

B. American Iron and Steel Institute (AISI) - Material Specifications

C. American Institute of Steel Construction (AISC) - Guidelines for the Design of Steel Structures

D. American Society for Testing and Materials (ASTM) - Stainless Steel Material Specifications

E. American Welding Society (AWS)

1.3 SUBMITTALS

A. Complete shop drawings and engineering data shall be submitted to the Engineer in accordance with the requirements of the Section 01 33 23 - Shop Drawings, Product Data and Samples.

B. The Manufacturer shall provide product data, drawings and calculations as follows:

1. Basin design and layout of equipment indicating all dimensions.

2. Head loss calculation through the plate settlers at maximum and design flow.

3. Head loss calculation through the sludge collector at design flow.

4. List of spare parts which could be purchased and kept on hand.

5. Complete submittal drawings of all equipment furnished.

6. Connection locations and support attachment details.

7. Manufacturer’s literature and cut sheets for all equipment.

8. Weights for major components and materials of construction.

9. Computational Fluid Dynamics (CFD) Modeling analysis of the inlet flow channel, inlet ports, flow diffusers, and basin flow distribution proving that these items would perform satisfactorily, demonstrated by distribution of the main flow into the sedimentation basins plus analysis of shear-forces that can harm the formation of larger flocs structures along the transport channels. The CFD shall be summarized in a report with findings and any recommended modifications of design features of the sedimentation basins or flocculation basin.

    a. CFD Modelling: Shall include the following:

        1) Numerical Domain & Volumetric Mesh

            a) The plate settler manufacturer shall develop the 3-D geometry files necessary for the modeling effort. All internals such as ports and tapered flume structures should be accurately modeled, i.e., all elements that have a significant effect on the flow patterns should be modeled. The numerical domain of one reactor will be modeled by a mesh of at least 6,000,000 cells.

    b. CFD Model

        1) The plate settler manufacturer shall use commercially available and widely used CFD modeling package such as STAR-CCM, FLOW-3D or ANSYS (Fluent or CFX) for performing the modeling.

        2) The CFD simulation will be performed to reach a Steady-State solution taking no less than 5,000 iterations. In Steady-State regime the basin features and diffusers are to be modeled by means of rotating reference frame model. In case that the specific geometry of the basin features and diffusers, through the rotating reference frame model, result on an inaccurate prediction of the Steady-State behavior of the flow through the described areas, a transient (time dependent) simulation should be carried out after the Steady-State simulation, using a model with real body motion and providing the time averaged solution.

        3) The manufacturer should provide a CFD simulation in transient (time dependent) regime showing the residence time distribution of a tracer pulse using the frozen flow field of the previously obtained Steady-State solution. The tracer pulse will be injected at the inlets for 5 seconds and the tracer concentration will be recorded at the outlets all time required until the tracer completely disappears from the basin.

        4) Two (2) CFD simulations will be performed with the difference being elevations in the inlet ports transitioning from inlet flow channel into

the sedimentation basin. First model will be all top of ports' elevation at 1-foot below the water level. Second model will be with ports near the bottom of the channel. Flow rates will be at specified design flow of 7.5 MGD entering the inlet flow channel and 3.75 MGD entering each sed basin for both simulations. Final dimensions to be provided by engineer of record.

c. Results

1) The manufacturer will provide a detailed description for the two simulations of the mean flow field, presenting the following items:

a) Magnitude velocity of the flow at several plane sections (horizontal and vertical)

b) Vector field at several meaningfully selected plane sections (horizontal and vertical)

c) Analysis of flow velocities through the inlet flow channel, inlet ports and flow diffusers

d) 3D Streamlines over the entire reactor

e) Mean age of effluent over the entire reactor

f) Diagram of Resident Time Distribution

g) Basin configuration, dimensions and features will be provided by the engineer of record for use within the simulation with basin inlet and outlet locations identified.

h) CFD results for both simulations will be provided in a report that addresses sedimentation, bulk fluid flow, overall mixing quality, analysis of shear-forces that can harm the formation of larger floc structures and short-circuiting.

10. NSF certificate with the NSF seal proving that the plate settlers and sludge collectors as manufactured for this project have NSF-61 approval. Include supporting documentation from NSF to confirm the approval. Seals of organizations other than NSF will not be allowed.

11. Statement indicating terms of the warranties

12. Installation, Operation & Maintenance Manuals

1.4 DELIVERY, STORAGE AND HANDLING

A. Plate settlers and sludge collectors shall be shipped on flatbed truck to allow access by crane provided by the Contractor.

B. Equipment shall be stored and protected in accordance with the manufacturer's recommendations.

1.5 SKILLED SUPERVISION

A. Manufacturer shall have a skilled representative available for installation inspection and start-up services as specified.

1.6 QUALITY ASSURANCE

A. Award for this project shall be based on the plate clarification system as shown on the contract drawings and listed in these specifications. Any costs resulting from changes to the structure, piping etc., required for alternate equipment shall be borne by the Contractor.

B. The inclined plate clarification system and flow control baffles manufactured and provided by Meurer Research, Inc. of Golden, Colorado shall be the base bid for this equipment and JMS Plate Settlers shall be a deductive alternate bid.

C. To assure system integrity and responsibility, all items of equipment described in this section shall be manufactured by a single manufacturer regularly engaged in the production of the specified equipment.

D. All plate settler and sludge collector manufacturers must have at least fifty (50) plate settler and fifty (50) hoseless sludge collector installations in operation for at least ten (10) years and be of the same design complying with these specifications for use in municipal potable applications as described above. At least five installations shall include proven performance with flocculators, flow control baffling and floating plate covers as specified for the project.

E. Alternate manufacturers must be approved by the Engineer a minimum of seven (7) days prior to bid opening to be considered. Submit a complete information package of alternate equipment for pre-approval containing all information necessary to show that the substitute equipment or material offered meets all requirements detailed in the specification. Provide installation references, drawings, structural calculations, basin inlet CFD analysis and NSF-61 certificates as specified in the Submittals section at least 30 days prior to the bid for evaluation. Include a written indemnification against patent infringement to the Owner.

F. Any alternate manufacturer who does not have written acceptance by the Engineer prior to bid will not be considered after the bid.

PART 2 - PRODUCTS

2.1 PLATE SETTLERS - DESIGN AND SCOPE OF WORK

A. The work shall include supply, delivery, installation inspection and training in the use of plate settlers.

B. The basins shall be in number, and dimension as shown in the contract drawings and as specified herein.

C. The plate system shall include the following elements without exception:

1. Helical flow inlet diffusers.

2. Plates and support frames with isolation baffles.

3. Flow distribution top tubes with flat walking surface and orifices to insure proper distribution across the plate width.

4. Effluent collection troughs with adjustable flat crested weirs conforming to Ten-State Standards <20,000 gpd/ft of weir length or orifice circumference.

5. Support I-beams which span basin width to support ends of the plate packs. Beams and mounting brackets shall be designed and provided by the plate settler manufacturer. Include intermediate support columns as required to minimize beam span.

6. Systems with more than 1.0 inches of water over the plates during operation at design flow are not allowed as they will prohibit routine cleaning, promote algae growth and solids settling atop the plates.

7. Plate covers shall be provided over the flow control deck to minimize biological growth due to light.

8. All wall mounted brackets, anchors and hardware as required.

2.2 PLATE SETTLERS - PROCESS DESIGN AND CONDITIONS

A.	Number of Basins	Two (2)
B.	Dimensions of each Basin	60.0’ L x 27.0’ W
C.	Design flow, each basin (process)	4.0 MGD
D.	Peak flow per basin (hydraulic)	4.0 MGD
E.	Effective Loading Rate at design flow	0.30 gpm/sq ft
F.	Plate efficiency	80%
G.	Angle of plate inclination	55^0
H.	Plate dimensions	9.50’L x 4.50’W
I.	Maximum number of plates per pack	56
J.	Number of plate rows per basin	Four (4)
K.	Number of plate packs per basin	Eight (8)
L.	Maximum cartridge weight allowed	4,000 lbs
M.	Number of effluent troughs per basin	Two (2)
N.	Design velocity in feed channels	<0.5 fps

2.3 PLATE SETTLERS - MATERIALS OF CONSTRUCTION

A. All components of the plate settler system shall be fabricated of stainless-steel materials.

Support Frame - ASTM A554, AISI Type 304L
Plates and Top Tubes - ASTM A240, AISI Type 304
Troughs - ASTM A240, AISI Type 316
Weirs - ASTM A240, AISI Type 316
Support Beams - ASTM A240, AISI Type 304L
Bolts, Nuts, Fasteners – IFI-104 GRADE 304

B. All fabricated stainless-steel components shall be properly treated to prevent future corrosion. All welds shall be bead blasted or mechanically cleaned per ASTM A380.

Nitric acid or other hazardous chemicals shall not be allowed for cleaning. Non welded parts shall be supplied with standard mill finish.

C. All components at the air-water interface shall be constructed of Type 316SS. This includes troughs, weirs, and end and side baffles. Submerged components including plate and top tube, support frame, support beam and wall brackets shall be Type 304SS.

2.4 PLATE SETTLERS - INLET FLOW CONTROL

A. The plate manufacture shall provide four (4) helical flow inlet diffusers per basin to reduce the velocity to less than 0.25 fps in a spiraling motion when entering the plate settler basin to prevent floc damage and to minimize velocity currents. The inlet diffusers shall direct the flow to properly line up with the plate settlers. The Contractor shall mount inlet diffusers on the inlet wall as shown in the Contract drawings.

B. Flow shall pass through the concrete inlet ports and be separated into two flow streams as it exits the diffuser. The diffuser shall create a helical flow pattern perpendicular to flow entering the inlet port opening. Flow shall exit the diffuser at a velocity approximately 50% of the velocity at the inlet port. Deflector plates or diffusers that do not provide a helical flow pattern are not acceptable. Provide CFD analysis per the Submittals section.

2.5 PLATE SETTLERS - PLATES

A. To ensure public safety, plate settlers shall be certified by NSF to ANSI Standard 61. Systems that do not have NSF-61 certification, certified by NSF will not be allowed. Other agencies or WQA certificates will not be an acceptable alternative.

B. The plate settling units shall operate in counter-current mode with clarified water flowing upward while settled solids move down. Incoming water shall be fed near the lower end of the plate from the side to allow the settled solids to fall to the floor of the clarifier without being re-entrained by the incoming flow.

C. The plates shall be of the size and quantity specified in the calculations to meet the settling area requirements. Plates will be arranged in factory assembled packs and shipped to the jobsite as one assembly.

D. The plates shall be inclined at an angle of 55° from the horizontal. The plate settlers shall have no moving parts.

E. Effluent flow at the top of the plate shall be removed in at least four (4) points to ensure even distribution across the full width of the plate. Plate settlers with less than four (4) take off points per plate or continuous full width slots are not acceptable. Plate settlers using a top flow control device with less than 0.5-inch of headloss shall not be allowed unless the plate efficiency factor is reduced by 20% below the specified efficiency.

F. To prevent short circuiting occurring above the plates, a water depth of less than 1.0-inch above the plate settlers shall be maintained during operation at design flow. A depth of more than 1.0-inch of water over the plate settlers at design flow will prohibit routine cleaning, promote algae growth and solids settling atop the plates and is not allowed.

G. The top of each plate shall be visible for inspection and cleaning during operation. The plate top tubes shall provide a flat walking surface. Flow control angles welded to the frame with an uneven walking surface are not acceptable.

H. Each plate shall have a tubular top support structure, integral bent sides and bottom stiffening element manufactured of 26-gauge (0.0178” minimum) stainless steel. Plates designed without an integral top tube shall be 22-gauge (0.0292” minimum). FRP (fiberglass), textured, ribbed, or corrugated sheets will not be accepted. Intermediate (center) spacers that may interfere with sludge migration are not allowed.

I. Plate pack frames shall be manufactured of rectangular or square tubing of minimum 14-gauge thickness adequately sized to meet the structural design criteria. Packs shall be self-supporting and shall not exceed the maximum allowable deflections under load conditions stipulated below.

J. Include end and side baffles of minimum 16-gauge material bolted watertight to the cartridge frame with sufficient freeboard at peak flow. Non removable upper baffling shall not be allowed.

K. Plate Settler Covers:

1. Covers shall be provided over the top of the plate packs and over the effluent collection troughs.

2. Plate covers shall be in contact with and shall insulate the water surface to prevent freezing.

3. The plate settler covers shall be manufactured of 20-gauge 304 stainless steel with closed cell foam contained beneath the cover without the need for glue or adhesive

4. Each cover shall span the entire width of the plate settler top deck. Covers shall be 54.5-inch wide by 48-inch long with shorter pieces making up the total length of each module. The edges shall be bent down 1-inch on each side. A ridged closed cell foam shall fill the underside of the covers.

5. The covers shall be placed on the top deck end to end and shall float at the water surface allowing flow into the top tubes.

6. The covers shall be provided with a hold down mechanism.

7. The plate covers shall not interfere with the flow through or above the plate settlers at any flow rate.

8. The covers shall be meet NSF Standard 61 requirements and shall be provided with an up-to-date NSF-61 certificate in the interest of public safety.

L. The plates shall be designed structurally for the following conditions:

1. 0.67 pounds per square foot of plate area live load (sludge load)

2. Maximum live load deflection of L/360 for all structures, etc.

3. A concentrated live load of 250 lbs. anywhere on the flow deck (top tubes) or top edge of plates

4. Troughs full of water when basin is empty.

2.6 PLATE SETTLERS - EFFLUENT COLLECTION TROUGHS

A. The effluent troughs shall be u-shaped and located to the side of the plate rows. Troughs located over the plate settlers obstructing access to the tops of the plates will not be accepted.

B. Weirs shall meet the Ten States Standard for Water Works regulatory requirement of <20,000 gpd per linear foot of weir length or orifice circumference under peak flow conditions.

C. Effluent troughs and weirs shall be manufactured from minimum 18-gauge stainless steel. Fasten troughs on plate pack frames every 24 inches minimum with adequate bracing to support a water-filled trough while the basin is empty. Include all brackets, trough supports, reinforcing sections, stiffeners, flanges, and hardware.

D. Effluent weirs shall be of the flat crested rectangular design. Weirs shall be adjustable without loosening bolts or nuts. V-notch weirs and bolt-on weirs are not acceptable. Weirs that establish a water level greater than one inch above the plates at design flow are not allowed.

E. The specified number of effluent troughs shall be provided to minimize installation cost and effluent wall openings. For basins with an even number of plate settler cartridge rows there shall be one trough per two rows. To insure even distribution between the inclined plates at all flow rates, overhead troughs or flow paths that create a variable pressure drop due to velocity changes are not allowed.

2.7 PLATE SETTLERS - STRUCTURAL SUPPORT SYSTEM REQUIREMENTS

A. To ensure compatibility, the manufacturer of the plate settlers shall provide wall brackets and stainless-steel I-beams of ¼-inch minimum material thickness to support the plate settler packs.

B. Support frames and beams shall be adequately sized to carry the load of the plate settling system under both wet and dry conditions without exceeding a maximum deflection of L/360 of the span.

C. The packs shall be supported from below on stainless I-beams. C-channel or tube-shaped supports are not allowed.

D. The manufacturer shall be required to coordinate structural details of the design with the Engineer. This will be required to determine the final location of beams, through wall inlet and effluent openings, sludge collection mechanism, flocculators, flocculation baffles and other design details which may affect the supply of structural support components.

2.8 HOSELESS SLUDGE COLLECTORS - PROCESS DESIGN AND CONDITIONS

A.	Number of Basins	Two (2)
B.	Dimensions of each Basin	60.0’ L x 27.0’ W
C.	Number of units per Basin	One (1)
D.	Sludge Flow per unit	150 - 200 gpm

E. Solids removal concentration: 0.5 - 2.0%

F. Number of Control Panels One (1)

2.9 HOSELESS SLUDGE COLLECTOR - MATERIALS OF CONSTRUCTION

A. All major components of the sludge collector shall be fabricated of stainless-steel materials accept as noted.

Cross bracing - ASTM A240, AISI Type 304
Header Assembly and Pipe - AISI Type 304L
Bushings, Flow Balancing Ring and Tangential Orifices – UHMW-PE
Cable Pulleys, collector pipe supports and wall casters - Polyurethane
Bolts, Nuts, Fasteners – IFI-104 GRADE 304

B. All fabricated stainless-steel components to includes all welds shall be properly cleaned, descaled, and passivated to prevent future corrosion per ASTM A380. Nitric acid or other hazardous chemicals shall not be allowed for cleaning. Non welded parts shall be supplied with standard mill finish.

2.10 SHARED REEL DRIVE ASSEMBLY - HOSELESS SLUDGE COLLECTORS

A. Each drive assembly shall consist of an SEW Eurodrive 3 Phase 230 VAC ¼ HP inverter duty motor and SEW Eurodrive gearbox which shall be coupled to a single rotating drum for manipulation of the cable that is attached to the tandem suction header assembly. Food grade lubricant shall be included. DC drives are not acceptable.

B. Only single drum drives are acceptable. Two or more cable drums are not allowed due to the high fleet angle created between drum and floor pulley.

C. The cable shall be firmly attached to the single rotating drum to prevent slippage. Tensioning the cable between multiple pulleys or use of a cable tensioning device to prevent slippage will not be allowed.

D. The cable shall store on the reel in a single layer, the placement of which shall be organized by the drive mechanism. To minimize cable travel and the fleet angle, the cables shall share the same space on a single drum.

E. The complete drive mechanism shall be packaged on a single powder coated stainless base. Include a two-piece powder coated aluminum safety cover with handles. Stainless or FRP covers are not allowed.

F. The drive cable shall be Type 304 Stainless Steel with a minimum diameter of ¼-inch. Collectors over 75-feet in length shall use pre-stretched cable. Pneumatic or steel tape drive systems are not acceptable.

G. The drive assembly shall be capable of ceasing operation on an excessive load without physical damage to the drive unit. During an overload, protection built into the VFD will cease operation and activate an alarm. Operation will continue after alarm is reset. Back up mechanical protection in the form of a shear pin is required.

H. The drive assembly shall have two integral position proximity sensors which determine when the collector is at the end and beginning of the basin. No under-water position sensors shall be required or allowed.

I. The drive shall have an emergency E-stop button pre-wired to the assembly which shall be a large, red, palm operated single button.

J. For outdoor installations subject to extended freezing conditions, the drive assembly shall include a thermostatically controlled drum heater to prevent icing. The drum heater shall be powered from the collector control panel.

2.11 HOSELESS SLUDGE COLLECTOR ASSEMBLY

A. To ensure public safety, sludge collectors shall be certified by NSF to ANSI Standard 61. Systems that do not have stamped NSF-61 certification for the collectors as specified in the manufacturers name will not be accepted. Other agencies or WQA certificates will not be allowed.

B. The sludge collector assembly shall be manufactured entirely of Type 304 stainless steel, except for non-metallic parts such as casters, bushings, orifices, etc. which will be manufactured of non-metallic materials.

C. Each collector assembly shall consist of four sludge collection header pipes each equal to half the basin width. Each header pipe shall have helical flow orifice blocks of UHMW-PE material spaced by the manufacturer to insure proper distribution across the length of the header. Header pipes shall have removable end caps for easy clean out.

D. Header pipes shall be 3-inch diameter attached to the collection chamber by means of a flanged connection. Use of clamps or other pipe connection methods will not be allowed.

E. The helical flow orifice blocks shall be designed to cause flow to enter tangentially into the header pipe for more efficient sludge removal and reduced head loss. Orifices shall be ¾-inch in diameter shaped to cause a spiral flow inside the header pipe to prevent solids from settling and shall point forward to remove the settled solids ahead of the pipe as it travels down the basin. Holes drilled in the bottom of the header pipe shall not be allowed. Systems without forward facing replaceable tangential flow orifice blocks of UHMW-PE will not be allowed.

F. The 6-inch collection chamber shall “telescope” over the smaller 4-inch fixed sludge exit conduit. Articulating pipes, flexible sludge hoses, flexible hose joints, or swivel joints are not allowed.

G. The collection chamber shall be isolated against the horizontal sludge exit conduit by means of a UHMW-PE bushing. The bushing shall be designed to pass small amounts of water to act as a lubricant during operation. A fully sealed connection between the two pipes is prone to binding and not acceptable.

H. The sludge exit conduit shall include a UHMW-PE flow balancing ring designed by CFD analysis to assure equal flow from the front and back sludge collection headers. Systems without a flow balancing ring will not be allowed. Lateral piping or flow diagonals from sludge headers to the collection chamber shall not be an acceptable alternative to the flow balancing ring.

I. Each sludge header pipe shall be equipped with a blade which is triangular and is roughly equal in length to the header pipe. These blades will move the settled solids away from the end walls.

J. The hoseless sludge collector assembly shall be guided along basin length by means of horizontal casters on the ends of the header pipes.

K. Flow through the hoseless sludge collector shall be controlled by a sludge valve as directed by the collector control panel. Submerged pump systems shall not be acceptable. Pumps (if used), valves, local disconnects, local power and actuator with position limit switches shall be provided by others under separate specification sections.

L. Each hoseless sludge collector shall be complete with polyurethane rolling casters to support the collector assembly and horizontal side wall casters located near the end of each of the four sludge collector headers. Use of anti-rocking skids in lieu of casters are not acceptable. Include all necessary mounting hardware.

M. Include stainless steel end stops to be anchored to the basin floor at the header assembly's end of travel.

N. All shop and field welds shall be performed by qualified welders in accordance with AWS D1.6. All seal welds shall be continuous, and all welds shall be mechanically cleaned per ASTM A380. Any field welding of pipe to complete the assembly shall include use of a pickling paste.

O. All underwater bearings shall be specifically designed for underwater use.

2.12 HOSELESS SLUDGE COLLECTORS - CONTROL SYSTEM

A. There shall be two collector control panels to operate two hoseless sludge collectors. The control panels shall communicate to the plant SCADA via Ethernet communication.

B. Each collector shall have a dedicated sludge valve. Sludge valves shall be supplied by others and powered and controlled by the valve's respective collector control panel.

C. Each Collector Control Panel - PLC type control system.

1. The collector control panel shall include an Allen Bradley Micro 850 PLC based electronic control panel which shall automatically control all functions and operations of the sludge collector system.

2. The panel shall arrive to the jobsite internally pre-wired ready to connect to each drive unit by utilizing (11) 14-gauge wires.

3. The panel shall operate by use of a 120 VAC 60Hz single phase circuit furnished to the panel location.

4. The panel shall consist of the following:

a. Real time clock for programmable run initiation.

b. Programmable Logic Controller.

c. Unmanaged Ethernet communication switch.

d. Allen Bradley PowerFlex VFD with manual operation keys and speed control. 120/240 VAC single phase input and 230 VAC, 3 phase output, ¼ HP minimum. DC motors are not allowed.

e. Power supply with 24 VDC control voltage.

f. Properly sized protective circuit breakers and terminal blocks.

g. 6” HMI (touch screen) shall be Allen Bradley PanelView displaying the following controls and indication: HAND/OFF/AUTO (3 position switch)

1) Manual start sequence
2) Drive mode – Reverse / Off / Forward
3) Valve position
4) Real time clock settings
5) Collector speed control
6) Alarm reset
7) Drive direction
8) Home and End position indication

h. One three position HOA switch and one three position valve open/auto/close switch per unit will be provided on the panel face for manual operation in case of PLC failure. Provide dry contacts or Ethernet for communication with the Plant SCADA system. If dry contacts, the following signals will be provided:

(a) Remote start
(b) Run condition
(c) Alarm condition

i. Provide Ethernet IP communication with the Plant SCADA system. Collector Basin Panel #1 shall be equipped with a Red Lion SLX-9ES-2SC unmanaged ethernet switch with multi-mode SC OM3 fiber port and 8-RJ45 ports for connection of control panel to plant SCADA. It shall also be supplied with a Dinspace SNAP-12SC MM dinrail mounted fiber optic patch panel to connect incoming fiber. Panel to be provided with 6 SC duplex connectors. Collector Basin Panel #2 shall be equipped with a Red Lion SLX-5ES-1 unmanaged ethernet switch which will be connected via CAT 6 to Collector Basin Panel #1.

D. The control panel components shall be installed inside a NEMA 4 rated aluminum control panel housing. Outside installations shall include a white powder coated aluminum solar sun shield and or ventilation fan, if required to maintain enclosure temperature. It shall be the responsibility of the sludge collector manufacturer to provide all necessary control hardware, programming and components as required for a complete installation.

2.13 HOSELESS SLUDGE COLLECTORS – SPARE PARTS

A. At a minimum, provide the following spare parts:

1. Two shear pins for each cable drive
2. One set of 8-inch polyurethane v-groove pulleys
3. Six UHMW Delrin wheel bushings

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment shall be stored in a secure area in strict accordance with the manufacturer's drawings and recommendations prior to installation. Any control panels shall be stored in a secure and dry area.

B. Install plate settler and sludge collection equipment as indicated on the contract drawings and in accordance with the manufacturer’s recommendations.

C. For Inclined Plate Settlers:

1. Install wall brackets and support beams level as shown on drawings.
2. Plate packs shall be shimmed and leveled, aligned, and anchored in place onto support beams as needed.
3. Install troughs between plate packs and grout effluent openings.
4. Install side and end zone baffling and level weirs.
5. Install flow diffusers on basin inlet wall.
6. Install floating plate covers.

D. For Hoseless Sludge Collectors

1. Anchor 4-inch fixed sludge pipe at basin centerline.
2. Bolt up 3-inch collection headers and cross bracing to 6-inch collection chamber.
3. Anchor pulleys, end stops and drive stand.
4. Mount drive and control panel as shown on drawings.
5. Power panel and run control wiring from panel to drive and valve actuator.
6. Link panel to plant SCADA and integrate via Ethernet connection.

3.2 WARRANTY

A. The manufacturer shall guarantee that the equipment including buy-out items are appropriate for the intended service and shall be free of manufacturing and fabrication defects in material and workmanship for a period of 12 months commencing from the date equipment is satisfactorily placed in service or 18 months from equipment delivery, whichever comes first.

3.3 PATENTS

A. The Contractor shall certify to the Owner that all equipment installed and any process resulting from use of the equipment provided is not subject to patent infringement or litigation which may result in patent controversy in which the Owner or Engineer may be named as a defendant.

3.4 PERFORMANCE

A. Plate settler troughs shall be tested at peak flow to prove capacity.

B. Plate settlers not using a distribution orifice type top tube across the width of each plate, or systems using v-notch weirs, must pilot test for a minimum 3-week duration prior to bid to prove plate settler performance based on the given loading rate and efficiency.

C. The sludge collector shall be able to remove up to a 2% solids concentration at a flow not to exceed 200 gpm.

D. Limiting water waste shall be the focus of the solids collection operations strategy. Given plant data, an operations and water waste scenario will be advised, and targets shall be met.

3.5 INSPECTION AND START-UP

A. Provide a factory certified service technician to inspect the installation and observe start-up and initial operation of the plate settlers and sludge collector systems.

B. The manufacturer shall provide a factory trained representative to perform the following:

1. Inspect installation of the plate settlers and sludge collectors. Provide a field report certifying that the equipment is properly installed, fully operational and ready for use.

2. The start-up technician will install drive cables and set travel limits of the sludge collector.

3. Support start-up and train the Owner's personnel on operation and maintenance of the equipment.

4. Include one trip of at least two eight-hour day(s) for inspection, startup, adjustment, and training.

END OF SECTION

SECTION 46 61 05

GAC CONTACTOR EQUIPMENT

PART 1- GENERAL

1.1 SCOPE OF WORK

A. *The Contractor* shall furnish all materials, equipment, labor, and appurtenances as required for the retrofitting four existing gravity filters into GAC contactors. The dimensions and surface area of the GAC contactors are shown on the Drawings. It shall be the responsibility of the Contractor to remove and properly dispose the existing sand and gravel filter media, and filter underdrains, furnish and install the new underdrains, air scour piping and air scour valves, rate-of-flow mag meters and modulating butterfly valves, radar level sensors, loss-of-head instruments, and related items of work shown on the drawings, and/or specified. . The Contractor is responsible for all work related to connection of all power supply and communication wiring and conduit for all GAC contactor valves. The existing filter backwash troughs shall remain in place and protected from damage during the work described herein.

B. *The Owner* shall remove and store the existing aluminum covers from the filters prior to start of work and replace them following the completion of the work described in this section. The Owner shall furnish and install new GAC media. The Owner shall also install new valve actuators on all existing filter valves, except the filter rate-of-flow modulating valve actuators and the air scrub butterfly valves prior to the start of the Contractor's work regarding this section.

C. *Individual backwash* shall be by automatic or manual control as outlined in these Specifications.

D. *Each GAC contactor* shall be capable of being backwashed independently without interruption of operation of the other contactors.

E. *Underdrain/air scour equipment* shall be capable of operating satisfactorily in the following operating conditions:

1. Downflow of water up to 4.3 gpm/sq. ft.
2. Equal distribution of air at a maximum rate of 5.0 scfm/sq. ft.
3. Equal distribution of air together with backwash water.
4. Equal distribution of backwash water, rates up to 18 gpm/sq. ft.

1.2 QUALITY ASSURANCE

A. *All parts that comprise the underdrain system* shall be designed and furnished by a single manufacturer. The manufacturer shall be responsible for the compatibility of all underdrain parts. In addition, the manufacturer must be regularly engaged in the manufacture of similar equipment.

B. *The manufacturer of the underdrain system* will modify his standard equipment to meet the minimum values specified for dimensions, design, and intent of this Specification.

1.3 REFERENCES

A. NSF - Standard 61 - Drinking Water Systems Components - Health Effects.

B. AWWA B100 Water Treatment Filtering Material latest edition.

1.4 SUBMITTALS

A. *Submit complete shop drawings* of all equipment furnished in accordance with Section 01 33 23, Shop Drawings, Product Data, and Samples, and including at a minimum, the following information:

1. Detailed general arrangement drawings showing the underdrain configuration and sufficient information describing the underdrain components to determine compliance with the Specifications.
2. Detailed installation instructions specific for this project.

1.5 OPERATION AND MAINTENANCE MANUALS

A. *Operation and maintenance manuals* shall be provided by the equipment manufacturer in accordance with the requirements of Section 01 78 23, Operating and Maintenance Data. Each manual shall be a bound, indexed binder prepared specifically for this project.

B. As a minimum the manual shall contain:

1. General arrangement drawings.
2. General arrangement detail drawings.
3. Erection drawings.
4. A complete bill of materials for the equipment.
5. Cut sheets of all items of equipment purchased from other manufacturers.
6. Installation and maintenance instructions for the specific equipment including the erection sequence, maintenance items, and trouble-shooting checkpoints.

1.6 DELIVERY

A. *Underdrain assemblies* shall be shop assembled to facilitate field erection and shipped in the largest sections permitted by carrier regulations. *All components* must be boxed and adequately marked for ease of erection.

B. *The underdrain system* shall be erected immediately upon receipt from the manufacturer or stored in strict conformance with storage recommendations provided by the manufacturer in the operations and maintenance manual.

C. The underdrain system shall be erected immediately upon receipt from the manufacturer or stored in strict conformance with storage recommendations provided by the manufacturer in the operations and maintenance manual.

PART 2 - PRODUCTS

2.1 GENERAL

A. *Base bid manufacturers* are F. B. Leopold Company, Inc.,(Xylem Water Solutions) of Zelienople, PA., and Roberts Filter Group, Wagontown, PA.

2.2 UNDERDRAIN DESIGN (LEOPOLD)

1. The underdrain system for the filters shall be the Leopold Type XA Filter underdrain with I.M.S.® 200 Media Retainer as manufactured by Xylem Water Solutions Zelienople LLC, Zelienople, Pennsylvania.

A. Experience

1. The underdrain system shall be a standard product of a filter manufacturer who has been actively providing dual-parallel lateral air/water underdrain equipment for at least 35 years. Upon request, the filter manufacturer will provide the Engineer with a list of installations of similar dual parallel lateral underdrain which totals not less than 200.

B. NSF Certification

1. All materials used in contact with the water and backwash air shall meet National Sanitation Foundation (NSF) Standard 61 Drinking Water System Components - Health Effects.

C. Underdrain

1. The dual-parallel block units with integral flow metering elements and any specialties required for installation such as special anchorage, grout retaining bridges, closures, gaskets, etc., shall be the products of a single manufacturer/supplier.

D. Uplift Certification

1. The underdrain manufacturer shall provide third party certification that the underdrain can withstand a minimum of 30 psi internal pressure without lifting or separating from the filter floor when properly installed with grout and/or mechanical anchoring. The certification and test report must be based on a representative test method to simulate an actual filter installation. A minimum of five (5) laterals shall be installed with a minimum length equal to at least one full length underdrain block. The test fixture shall have two side supports/walls and the ends of the underdrain blocks shall not be restrained or grouted in place.

E. Hydraulic Demonstration

1. The underdrain manufacturer shall, at their own facilities, if requested by the Engineer, set up a test lateral run of equal length to that required by the project

and provide an opportunity for the Engineer and/or Owner to visit the facility to witness a full-scale demonstration of the headloss and flow distribution during backwash.

2. The test facility shall be capable of demonstrating concurrent air and water distribution in a submerged trough and water only distribution on a non-submerged test bench.

3. These demonstration services shall be provided by the filter manufacturer with reasonable notice and at no additional expense to the Owner or Engineer.

2.3 AIR HEADER

A. *The air distribution* system shall be generally comprised of a header specially calibrated to evenly distribute air flow via properly located feed pipes to each underdrain lateral. Sufficient relative velocities shall be maintained in both the header and feed pipes to ensure proper distribution of air.

B. *The air header piping* shall be 6-inch, Schedule 10S, Type 316L: stainless steel. The anchors and hardware for anchoring the air header shall be Type 18-8 stainless steel.

2.4 AIR SCOUR EQUIPMENT

A. *The air scour system provided* shall incorporate 6-inch air control butterfly valves manufactured by Pratt with electric actuator by Rotork, 6-inch Schedule 10S, air feed pipes (stainless steel) into each filter and Type 316L stainless steel feed pipes attached to each lateral. The system furnished shall be designed to operate at a rate of 5.0 scfm/sq. ft. of filter.

2.5 GAC MEDIA

A. The media for the GAC contactors will be furnished and installed by the Owner.

PART 3 - EXECUTION

3.1 INSTALLATION

A. *Manufacturer's Service Representative.* The equipment shall be furnished complete by the manufacturer and shall be assembled, erected and installed by the General Contractor as directed by the manufacturer in his working drawings and written instructions. The installation shall be checked and approved by a factory representative before acceptance.

1. The Manufacturer shall include in his bid the services of a factory trained field service representative for a period of four days and two trips for the contactors. One trip shall be made prior to installation to instruct the Contractor's personnel in the most efficient methods of installation of the underdrain/air scour system and to inspect the condition of the floor of the contactors. The manufacturer's representative shall certify that the floor of

the contactors is acceptable and shall inspect the completed installation, and assist the Contractor in start-up and testing. The representative shall also instruct plant personnel in operation and maintenance of the equipment.

B. *Anchorage.* The equipment manufacturer shall furnish all required anchor bolts, leveling nuts, washers, and tie down nuts and washers. All anchorage components, except washers, shall be 316L Stainless Steel. Washers shall be E.P.D.M. The anchorage shall be placed by the Contractor in exact accordance with the manufacturer's certified dimension prints and as directed by the manufacturer. The Contractor shall furnish all templates needed to accurately set the anchor bolts to the dimensions and projections specified.

C. *GAC Media.* The Owner shall furnish and install the GAC media.

D. *Backwash Troughs.* The existing backwash troughs shall be kept in place with weir edges to exact elevations as shown on the plans. Weir edges shall be leveled to within 1/16 inch over the entire weir length.

E. *Piping and Connections.* All gaskets and sealants used during installation shall be suitable for contact with potable water.

3.2 REMOVAL OF THE EXISTING MATERIALS

A. *Description*. The Owner will remove and store the existing aluminum covers, except the access hatches, on the existing Filters No. 1 thru No. 4 prior to start of work on these filters. After covers have been removed, Contractor shall remove the existing filter sand and gravel media and underdrains, including grout, from the existing filters. Schedule all work on the filters in such a manner so as to minimize interference with the production of water or other plant operations. Coordinate this work with the Owner and the Engineer. Submit proposed schedule of filter renovation for approval prior to start of any work.

The filter from which the media is to be removed shall be hydraulically isolated by closing the appropriate valves and completely draining the filter. Prior to commencing removal of the media, submit to the Engineer in writing the equipment and the method proposed to remove the existing media.

B. *The existing sand and gravel media* shall be removed carefully with hand tools and buckets or by means of a vacuum hose or eductor to avoid damage to the existing filter structure. The existing media shall be disposed of in a manner to be approved by the Owner, and in accordance with all applicable local, state, and federal regulations. All costs for such disposal shall be paid by the Contractor. After the existing media is removed, the existing and underdrains shall be removed and properly disposed.

C. *After the existing media is completely removed*, the filter walls and filter troughs shall be thoroughly pressure cleaned to remove any scale or mud. Concrete floor shall be made smooth by means as necessary prior to installation of new underdrain.

3.3 UNDERDRAIN INSTALLATION

A. *Requirements*. The Contractor shall install the filter underdrain system in strict accordance with: (1) the manufacturer's written instructions and recommendations and the manufacturer's installation drawings; (2) the oral and written directions provided by the manufacturer's technical representative who is supervising and observing the work; and (3) any additional requirements specified herein.

B. *Floor Preparation*. Care shall be exercised in preparing the filter floor slab and in setting the anchors to assure proper alignment and elevation. Stainless steel anchor rods shall be furnished by the filter manufacturer, where required, and set in the floor slab on both sides of the distribution flume in accordance with the Drawing provided. The floor slab shall be screeded into a flat level plane and be free of protrusions and depressions.

C. *Underdrain Lateral Installation*. The underdrain laterals shall be set in relatively level rows over the filter floor slab. Plates for closing the ends of each row of blocks or laterals shall be furnished by the filter manufacturer and installed by the Contractor.

D. *Cleaning and Protection During Installation, Testing, and Startup*. The Contractor shall take all precautions recommended by the underdrain manufacturer or specified herein to ensure that the filter underdrain system and any piping communicating therewith is completely clean and free of any debris, dirt, or other foreign materials which could clog the underdrain system or interfere with flow. Backwash air and water piping shall be thoroughly flushed clean. All loose debris and dirt within the filter cell and flume shall be removed by brooming down and vacuuming. Care shall be taken to keep grout from being deposited anywhere where it could interfere with flow. Any grout so deposited shall be removed.

3.4 INSPECTION

A. *After underdrain/air scour inspection* by the manufacturer’s representative, a written report shall be furnished by the equipment manufacturer and shall describe the representative’s observations. This report shall describe in detail any deficiencies noted. All such deficiencies, whether by the manufacturer or Contractor, shall be corrected at no expense to the Owner.

B. *Installation of the underdrains* shall be reviewed by the equipment manufacturer’s representative including observation of air testing.

C. *Prior to final approval*, the manufacturer shall submit a letter certifying that the installation meets all requirements of the manufacturer.

3.5 PERFORMANCE DEMONSTRATION TEST

A. *After start-up and prior to final acceptance*, the Contractor shall conduct Engineer witnessed performance demonstration tests on the underdrains.

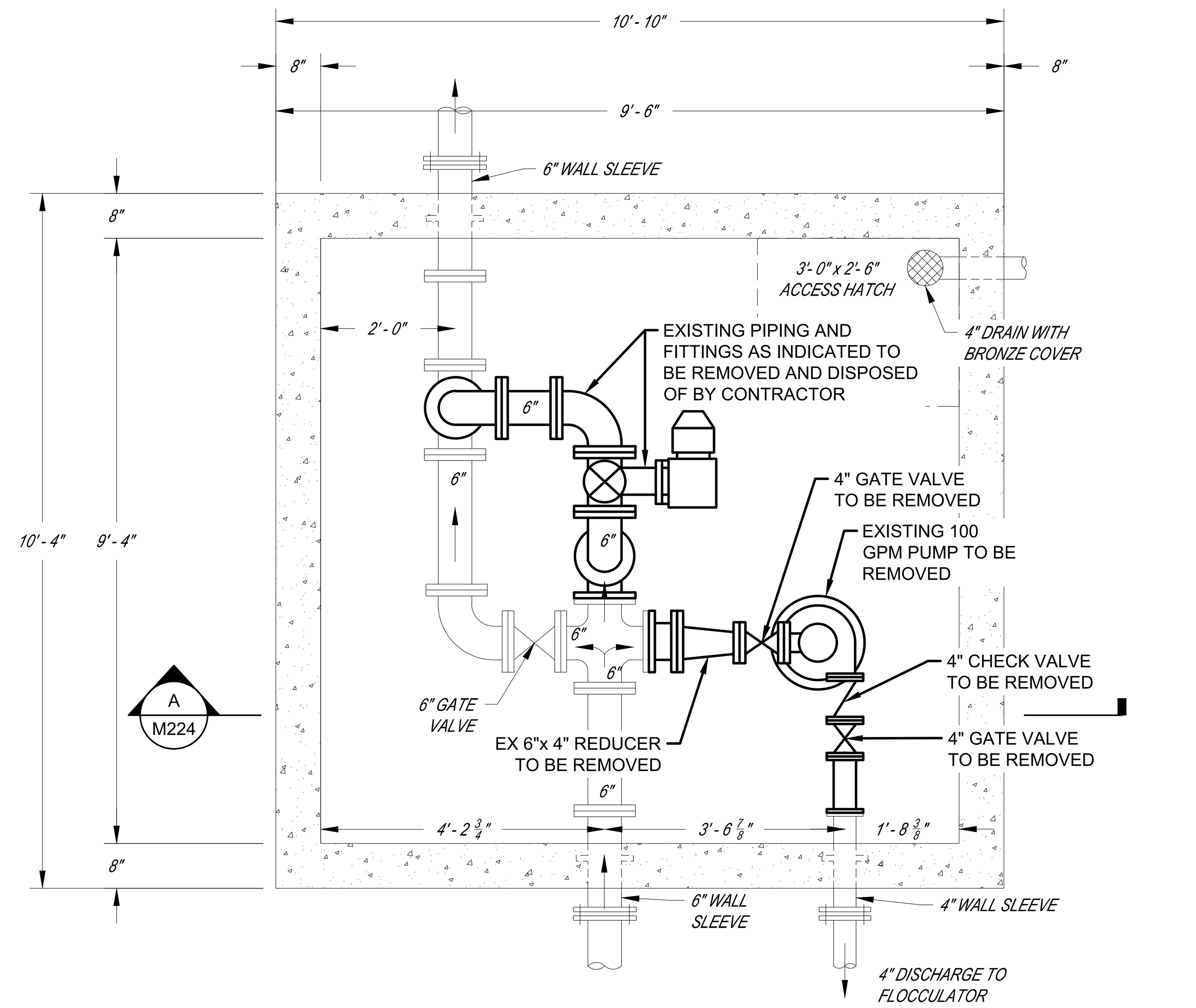
B. *The specific tests to be performed* will be developed by the manufacturer and be subject to approval by the Engineer. Test procedures shall be submitted to the Engineer for approval with submittal drawings. Tests shall be scheduled with the Engineer at least two weeks prior to the planned test date.

C. *After the underdrain system has been installed*, and before the media is put into the contactor, the underdrain system shall be tested for uniform air scour distribution and combined air scour water backwash distribution. Air distribution shall be uniform over the entire range of operation. The test shall be witnessed and certified by a manufacturer's field service representative.

D. *The field service representative* shall submit to the Engineer a written report stating that the underdrain systems have been checked and are suitable for operation.

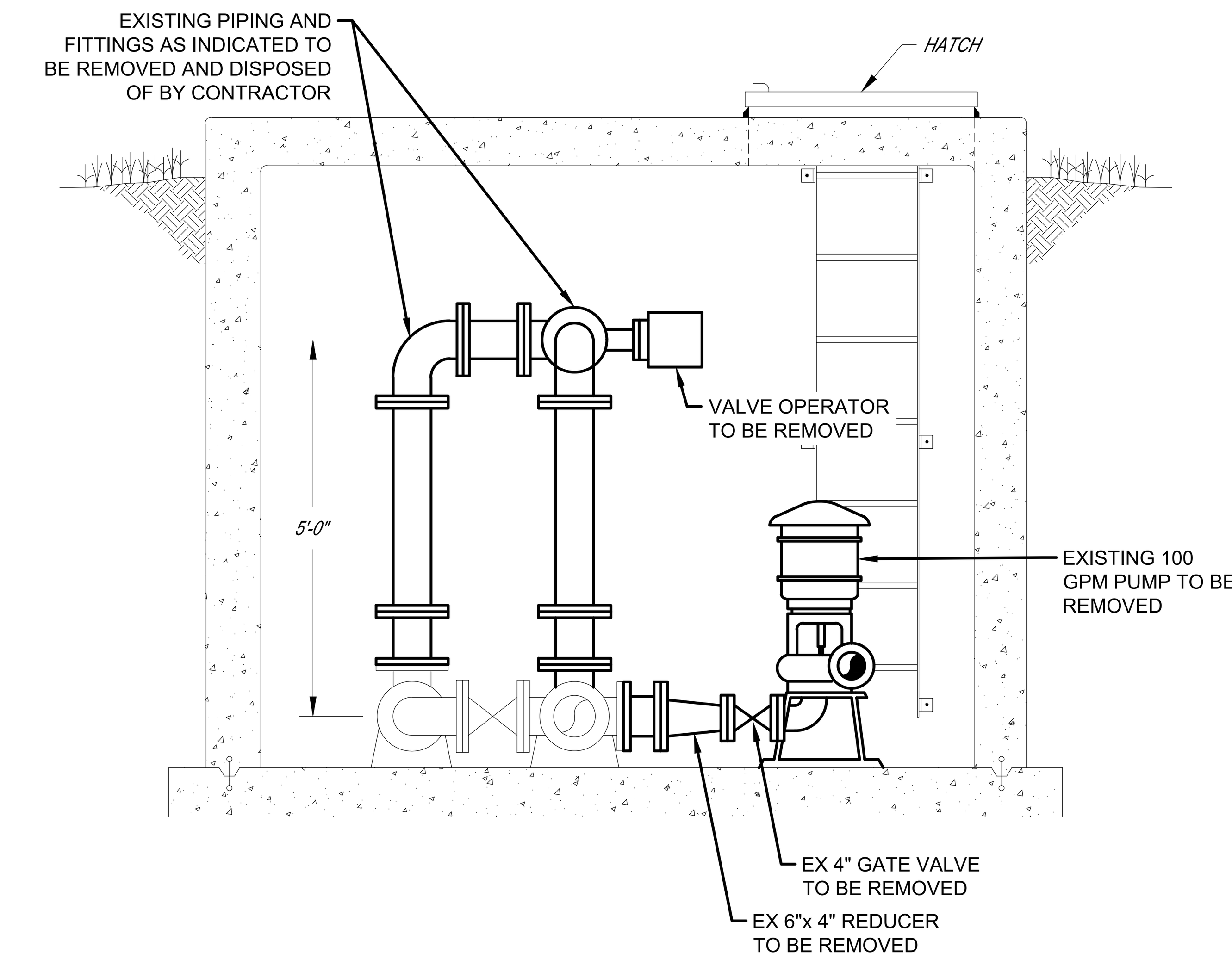
END OF SECTION

CTI PROJECT: C24038-01, DRAWING: C24038-01 _C24038-2 EX SLUDGE PUMP STATION (857507v9/6/13/25 1:17PM), LAYOUT: M224



DEMOLITION PIPING PLAN

SCALE: 1/2" = 1' - 0"

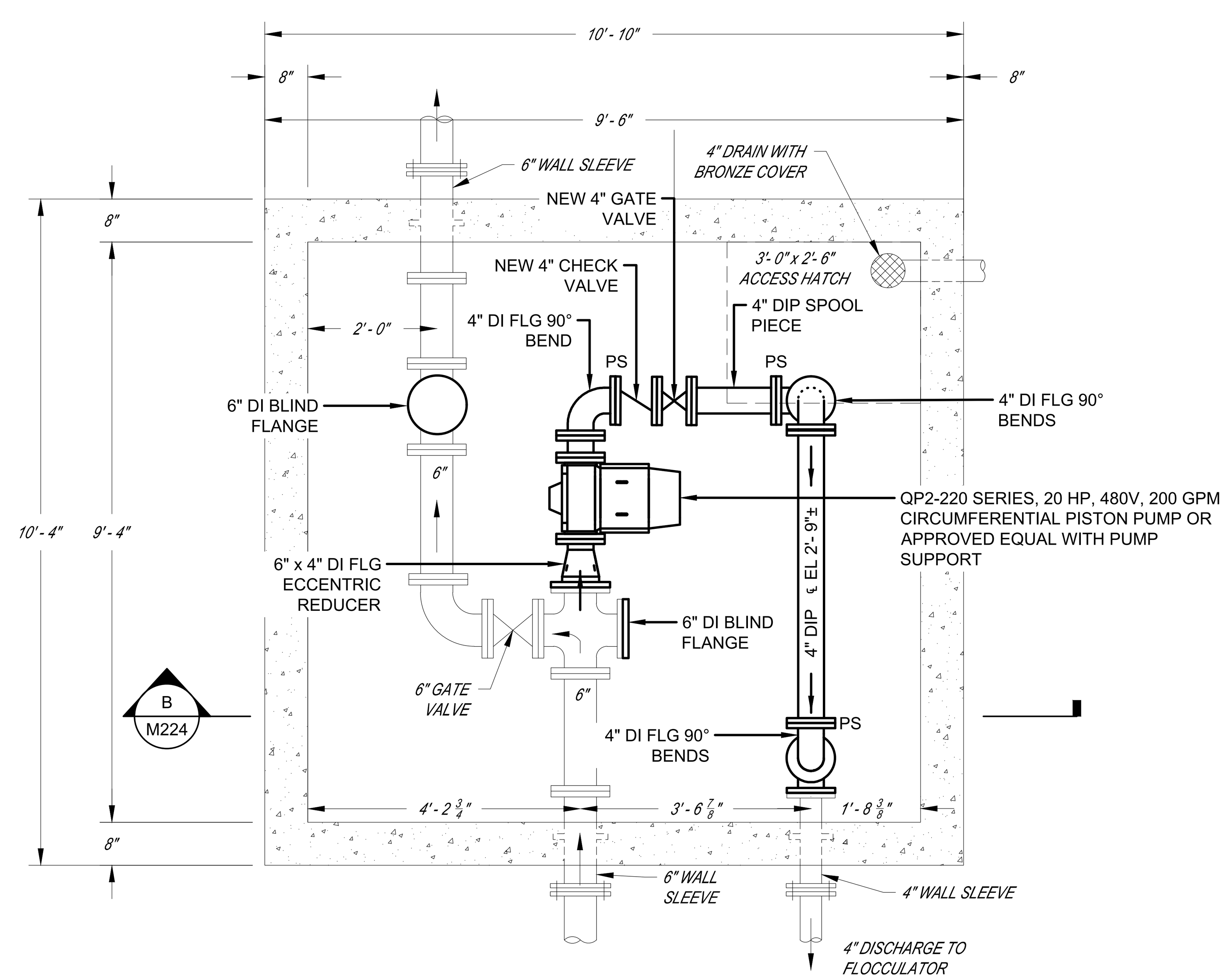


A
M224

SECTION

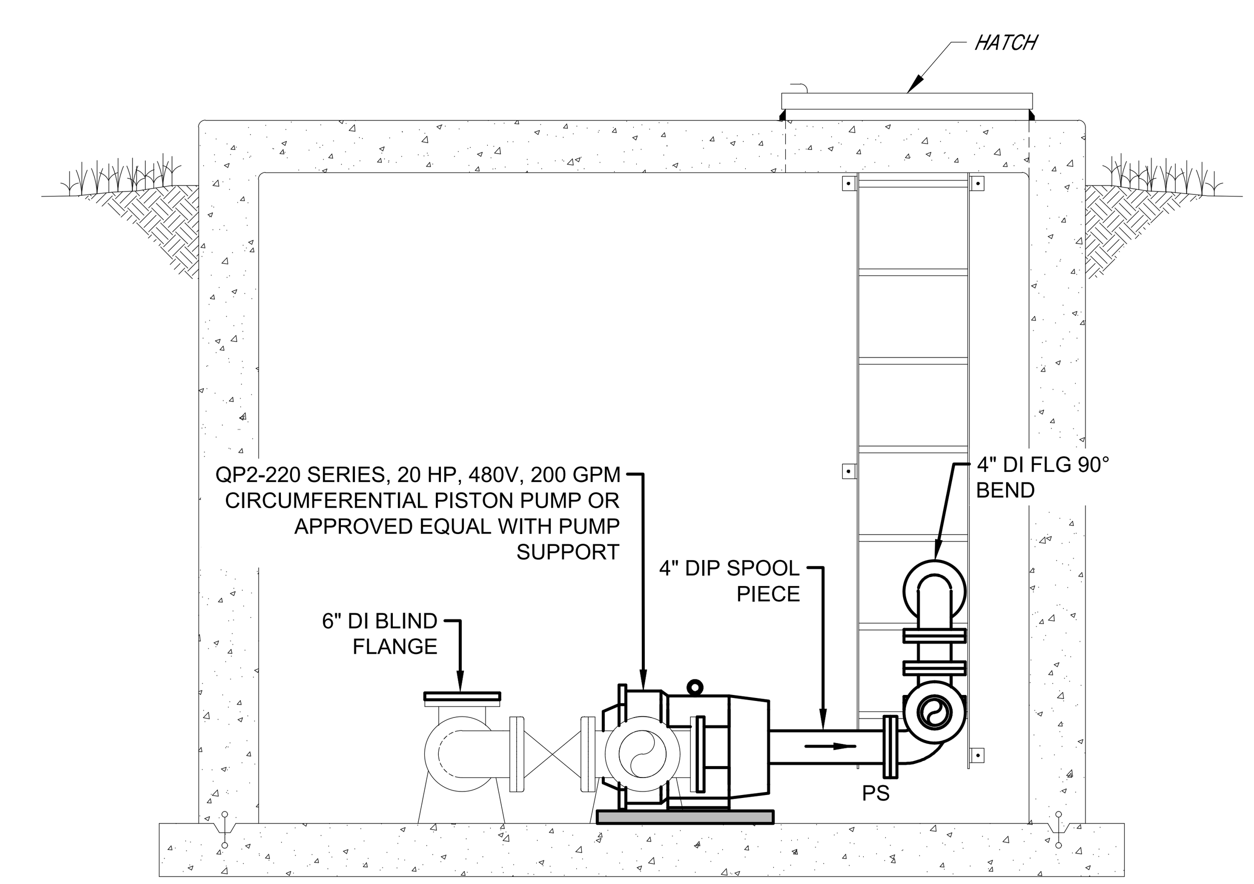
1/2" = 1'

2' 1' 0 1' 2'



PIPING PLAN

SCALE: 1/2" = 1' - 0"



B
M224

SECTION

1/2" = 1'

2' 1' 0 1' 2'

NOTES:

1. REFER TO DRAWING M222 FOR PIPE SUPPORT (PS) DETAIL.
2. ALL ELEVATIONS ARE BASED ON EXISTING SLUDGE PUMP STATION VAULT FLOOR.
3. CONTRACTOR SHALL VERIFY ALL DIMENSION BEFORE BEGINNING CONSTRUCTION. ALL NEW PIPING AND PUMP ARE SHOWN IN APPROXIMATE DESIRED LOCATION. CONTRACTOR IS RESPONSIBLE FOR FINAL LOCATION BASED ON EXISTING CONDITIONS. ADDITIONAL PIPE AND FITTING MAY BE REQUIRED AT THE CONTRACTORS EXPENSE.
4. ALL EXISTING AND NEW EXPOSED PIPE, FITTINGS, AND VALVES SHALL BE COATED IN ACCORDANCE WITH THE SPECIFICATIONS.

REVISIONS

NO.	DESCRIPTIONS	DATE	BY	APP'D
1	GENERAL REVISIONS	06/25	JRB	JDH

DESIGN	DRAWN	CHECKED	APPROVED
JDH	ZWR	JRB	JDH

DUCK RIVER UTILITY COMMISSION
WATER TREATMENT PLANT IMPROVEMENTS
CONTRACT 2 - WATER TREATMENT PLANT

EXISTING SLUDGE PUMP STATION
PLAN AND SECTION

CTIENGINEERS
1122 RIVERFRONT PARKWAY
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JEROME D. HIGHTOWER
REGISTERED ENGINEER
STATE OF TENNESSEE

JOB NO.
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