

**Division 11**  
**Equipment**



**PART 1 - GENERAL:**

1-1 WORK DESCRIPTION

- A. This Section applies to all pumping equipment as specified in Sections 11210: Pumps.
- B. Specific requirements of individual pumping equipment sections shall be in addition to the requirements of this Section.
- C. The specification of the individual pumping equipment section shall govern over this Section, wherever the specifications are not the same.

1-2 SUBMITTALS

- A. Submit in accordance with Section 01330: Submittals.
- B. Provide technical submittals to demonstrate that all equipment provided conforms completely to the requirements of the individual pump equipment section.
- C. Product Data
  - 1. Catalog cut sheets and written description of each item describing its operation.
  - 2. Construction materials.
  - 3. Performance curves for entire range of pump for capacity, total dynamic head, brake horsepower, efficiency, and net positive suction head required. Indicate specified conditions.
  - 4. Motor and electrical data.
  - 5. Mechanical seals
- D. Shop Drawings
  - 1. Detailed dimensional drawings indicating overall dimensions, elevations, weights, sizes and required clearances, and incorporation of the pump into the project setting
  - 2. Identify any physical or operational conflicts or issues.
  - 3. Cross section drawings labeling all interior parts including bearings, seals, and other mechanical parts.
  - 4. Diagrams indicating oil compartments and cooling mechanism.
  - 5. Anchoring and mounting details.
- E. Verification
  - 1. Submit verification submittal of performance requirements and testing for each pump. Verification submittal shall include:
    - a. The actual performance curves from shut-off to the maximum flow rate of the pump for capacity, total dynamic head, brake horsepower, efficiency, and net positive suction head required. Provide family of curves for pump operating with VFDs.
    - b. Required test results

- c. Pump and motor serial numbers
  - d. Fluid used in test
  - e. Fluid characteristics including specific weight, temperature, viscosity and vapor pressure
  - f. Location of test
  - g. Date of test
  - h. Person responsible for test
2. Submit verification submittal after initial submittals is approved by the COR.
  3. Pumping equipment shall not be shipped from the manufacturer until the verification submittal is approved by the COR.
- F. Operation and Maintenance Information: Provide operation and maintenance information in accordance with Section 01770: Contract Closeout.

### 1-3 QUALITY ASSURANCE

#### A. Manufacturer's Qualifications

1. The pumping equipment within an individual pumping equipment section shall be provided by the same manufacturer.
2. The pump manufacturer shall have been engaged in the production of the type of equipment being provided for the past five years.

#### B. Installer's Qualifications: The installer shall have five years experience in the installation of the type pump being provided. The installer shall be approved by the pump manufacturer.

#### C. Reference Standards

1. Definitions, terms, procedures, and other consideration shall be as set forth in the Hydraulic Institute Standards, latest Edition.

#### D. Testing – General

1. Required tests shall be performed for all pumping equipment included in this Project.
2. Provide for all equipment necessary to perform the tests.
3. Testing procedures shall be in accordance with the Hydraulic Institute Standards, latest Edition, unless otherwise modified in this Section.
4. Performance tests shall be conducted using the pump with its respective driver provided for this Project or may be from historical tests within the past 5 years.
5. Tests shall be conducted by the manufacturer or a manufacturer's certified representative.

#### E. Testing Requirements for Pumps

1. Pumps include, but are not limited to:
  - a. Centrifugal pumps
  - b. Vertical turbine pumps
  - c. Other pumps operating in a kinetic nature

2. Factory Tests
  - a. Performance Test
    - 1) Demonstrate that the pumping equipment satisfies the performance requirements of Part 2 of the individual pumping equipment section.
    - 2) Develop the actual performance curve from shut-off to the maximum flow rate of the pump using a minimum of five points.
    - 3) Test tolerances: Satisfy one of the following tolerances:
      - a) At the specified head the capacity shall be within 10% above the specified capacity.
      - b) At the specified capacity the head shall be within 5% above the specified head.
  - b. Hydrostatic Test
    - 1) Test each part of the assembled pump containing fluid under pressure.
    - 2) Test pressure: The greater of the following:
      - a) 150% of the maximum specified operating head.
      - b) 125% of the head at shut-off.
    - 3) Test duration: 5 minutes
    - 4) No leakage of fluid shall be evident.

#### 1-4 MANUFACTURER'S REPRESENTATIVE

- A. A manufacturer-trained and certified representative shall check the installation, supervise the initial start-up and operation, and instruct the COR's personnel in the proper operation and maintenance. The manufacturer's representative shall spend a minimum of time on site performing these services as specified below, and as specified in other related specifications sections. In case of conflict between requirements, the greater amount of time shall control. The start-up and training shall be repeated for pumps of the same type that serve different functions, or are located in different processes or at different locations.

##### Startup and Training Time

8 hours startup at each pump station

8 hours training at each pump station

- B. Return visits shall be made as required until the equipment is demonstrated to be operating properly. Return visits shall be at no additional cost to the Government.

#### 1-5 SPARE PARTS

- A. Provide the following spare parts in accordance with the General Requirements:
  1. Minimum one (1) gallon of lubricant for each pump provided.
  2. Refer to the individual pump equipment section for additional spare parts.
- B. Parts shall be of the same manufacturer and quality as those provided with the equipment.

1-6 DELIVERY, STORAGE, AND HANDLING

- A. Handling and storage instructions shall accompany the equipment delivered to the site. Store all equipment in accordance with the manufacturer's instructions.
- B. Pumps and motors shall be stored in a dry sheltered environment, protected from wind, rain, snow and other precipitation.

**PART 2 - PRODUCTS:**

2-1 PROTECTIVE DEVICES

- A. Provide suitable non-rotating metal guards for all exposed rotating shafts, couplings, belts, sheaves, and chain drives.
- B. Provide suitable non-rotating guards for all rotating shaft ends, which are exposed and protrude more than ½ times the shaft diameter.

2-2 SPECIAL TOOLS

- A. Provide special tools necessary for maintenance of pumps and motors including, but not limited to tools required for maintenance of bearings and seals.

2-3 ANCHOR BOLTS

- A. Stainless steel in accordance with Section 05505, Anchor Bolts, Expansion Anchors, and Concrete Inserts.

2-4 MOTORS

- A. Motors shall be rated for an altitude of 3,000 feet above sea level.
- B. The brake horsepower required by the pump and drive shall not exceed the rated horsepower of the motor or encroach on the motor service factor.
- C. Service factor shall be 1.15.
- D. Motors shall be TEFC, unless specified otherwise.
- E. Motors shall be heavy duty rated, unless specified otherwise.
- F. Motors shall be energy efficient rated.

**PART 3 - EXECUTION:**

3-1 INSTALLATION

- A. As shown on the Contract Drawings, approved Shop Drawings, and as recommended by the manufacturer
- B. Provide concrete base pads as shown on the Contract Drawings and as required for proper elevation and anchoring of the pump.
- C. Use non-shrink grout under pump bases.

- D. Do not induce stresses on connecting piping.
- E. Check condition of bearings in pump and motor. Add lubricant according to manufacturer's recommendations.
- F. Check for proper motor rotation.
- G. Provide copper tubing from pump base drain to nearest floor drain.

**PART 4 – MEASUREMENT AND PAYMENT:**

4-1 MEASUREMENT

- A. All work required in this section shall not be measured for payment.

4-2 PAYMENT

- A. Compensation to the Contractor for all work required in this section shall be included in the prices bid in the schedule for the Pumps. No separate payment to the Contractor shall be made for the work required in this section.

**END OF SECTION 11205**

**PART 1 - GENERAL**

1-1 SUMMARY

- A. This section covers the following pumping units:
1. Tank and House Water System
  2. Equalization Tank Pumps

1-2 REFERENCE STANDARDS

- A. The work in this section is subject to the requirements of applicable portions of the following standards:
1. NEMA Standards
  2. OSHA Rules and Regulations

1-3 SUBMITTALS

- A. Submit in accordance with Section 01330: Submittals.
- B. Complete fabrication, assembly, foundation and installation drawings, together with detailed specifications and data covering material used, parts, devices, and other accessories forming a part of the equipment furnished, shall be submitted in accordance with the submittals section. The data and specifications for each unit shall include but shall not be limited to the following:
1. Pumps
    - a. Name of Manufacturer.
    - b. Type and model.
    - c. Rotative speed.
    - d. Direction of pump rotation.
    - e. Size of suction nozzle.
    - f. Size of discharge nozzle.
    - g. Net weight of pump only.
    - h. Net weight with baseplate and couplings.
    - i. Complete performance curves showing capacity versus head, NSPH required, pump and wire-to-water efficiency, and bhp. Pump curves shall include a family of curves showing operation at less than full speed.
    - j. Type of coupling.
    - k. Data on shop painting.
  2. Motors
    - a. Name of manufacturer.
    - b. Type and model.

- c. Type of bearing and lubrication.
  - d. Rated size of motor hp.
  - e. Temperature rating.
  - f. Full load rotative speed.
  - g. Net weight.
  - h. Efficiency at full, 3/4, and 1/2 load.
  - i. Full load current.
  - j. Locked rotor current.
  - k. Space heater wattage.
  - l. Proof of conformance at operating altitude.
3. Complete Pumping Unit
- a. Maximum overall dimension.
  - b. Total weight.
4. Base plate
- a. Detailed fabrication drawings.

#### 1-4 QUALITY ASSURANCE

- A. Equipment furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by the COR. Definition of terms and other hydraulic considerations shall be as set forth in the Hydraulic Institute Standards.

#### 1-5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Box, crate, or otherwise completely enclose and protect all equipment during shipment, handling and storage.
- B. Protect equipment from exposure to elements and keep all items thoroughly dry at all times.
- C. Store pumps, motors and electrical equipment in weathertight warehouses that maintain temperature of 50°F minimum.
- D. Painted surfaces
1. Protect against impact, abrasion, discoloration and other damage.
  2. Repaint, to satisfaction of the COR, all painted surfaces that are damaged before acceptance of equipment.
- E. Protect electrical equipment, controls, and insulation against moisture or water damage.

### **PART 2 - PRODUCTS**

#### 2-1 GENERAL

- A. All anchor bolts, nuts, and washers shall comply with the anchor bolts and expansion anchors section. Anchor bolts shall be accurately located and centered in pipe sleeves as detailed on the drawings and required by the manufacturer.
- B. Base plates shall be provided with adequate openings to facilitate grouting and openings for electrical conduits.

2-2 PERFORMANCE AND DESIGN CRITERIA

A. Summary

Pump	Location	No. of Units	Type	Manufacture and Model
P300	Tank and House Water System	1	Water Pressure Booster System, 26 gpm at 40 ft	Pressuriser® RP-25HP, or approved equal
P401/ P402	EQ Tank	2 (1-operational, 1-standby)	Submersible Sewage, 50 gpm at 16 ft	Goulds 3WD, or approved equal

- B. Each submersible pumping unit shall be designed for the following performance and operating conditions at maximum speed, unless otherwise noted.

Performance Conditions	P401 / P402
1 Principal Design Point:	
a Flow at Principal Design Point, gpm	50
b Head at Principal Design Point, feet	16
2 Design Point 2:	
a Flow at Principal Design Point, gpm	40
b Head at Principal Design Point, feet	17.5
3 Design Point 3:	
a Flow at Principal Design Point, gpm	60
b Head at Principal Design Point, feet	15
4 Minimum motor size, hp	1/3
5 Impeller Diameter, in	2.94
6 Drive	Constant

Operating Conditions

1. Duty	Intermittent
2. Ambient Environment	Interior / Submersible
3. Ambient temperature (degrees F)	0-90
4. Fluid service	Water with leaves, needles, fish feces
5. Fluid temperatures (degrees F)	33-90
6. Fluid pH range	5 to 9
7. Fluid specific viscosity	1.00

8. Project site elevation (above msl) 3,000 ft

2-3 MATERIALS

- A. The impeller, bearing/seal housing and motor cover of submersible pumps shall be of ASTM A48 Class 30 high quality cast iron for strength and long life. The casing shall be cast from ASTM A48 class gray cast iron of sufficient thickness to withstand 1.5 times the shut off pressure generated by the largest impeller available for this model.

2-4 CORROSION PROTECTION

- A. The submersible pump/motor shaft wetted-end shall be series 400 stainless steel. Both inner and outer surfaces of cast iron shall be electro-coat-painted with thermo-setting Acrylic Enamel baked at 400°F., after castings are completely machined.

2-5 MOTOR

- A. The integral motor of the submersible pump shall be completely sealed from the environment by use of circular cross section o-rings accurately fitted into machined grooves which shall provide designed compression of metal to metal fits. Designs which require a specific torque on the casing bolts or which require rectangular gaskets or sealing rings shall not be allowed. The motor shall be rated for continuous duty under full nameplate load at full submergence.

2-6 POWER CABLE

- A. The submersible pump power cable shall be sealed at the motor end as it enters the motor casing by a two part barrier to moisture intrusion. The first line of defense shall be the compression of the oil and chemical resistant grommet which shall seal the outer jacket of the power cord. In the event that the outer jacket of the power cord should become damaged, then the second line of defense shall be the epoxy poured isolated conductors within the jacketed cable itself. The insulation shall be removed from the individual conductors and the epoxy shall be allowed to form a leak-proof seal against wicking of the power cable between the outer jacket and the insulation of the individual conductors. The outer jacket of the power cord shall be oil resistant and water resistant. The power cable shall be rated for NEC severe service "S", type "SJTOW" or "STOW". The heat and seal sensor cable shall be NEC severe service "S", type "SJTOW".

**PART 3 - EXECUTION**

3-1 INSTALLATION

- A. Installation procedures shall be as recommended by the pump manufacturer, the Hydraulic Institute Standards, and as required herein.

3-2 INSTALLATION CHECK

- A. Provide services of an experienced, competent, and authorized representative of manufacturer or supplier of equipment to visit site of work and inspect, check, adjust, if necessary, and approve equipment installation.
- B. Equipment supplier representative shall be present when equipment is placed in operation.
- C. Equipment supplier representative shall revisit jobsite as often as necessary until all trouble is corrected and equipment installation and operation are satisfactory in opinion of the COR's representative.

3-3 FIELD PUMP TESTING

- A. Pumping test shall be performed by the Contractor in the presence of the COR and a representative of the pump manufacturer, and in accordance with the Hydraulic Institute guidelines.
- B. Manufacturer's representative shall satisfy himself that the installation and alignments are satisfactory.
- C. Run a pump test in the installed condition to verify pump design.
- D. Contractor to furnish all required equipment.
  - 1. Pressure gauges certified by recognized laboratory.
  - 2. Watt meter certified by recognized laboratory.
  - 3. Contractor to provide certified water flow meter and temporary piping for testing.
  - 4. Record volts and amps to each leg of pump current.
- E. Run pump at system condition as close to design condition as possible.

3-5 REPORT

- A. Furnish to the COR, a written report prepared by equipment supplier certifying:
  - 1. Equipment has been properly installed and lubricated.
  - 2. Equipment is in accurate alignment.
  - 3. Equipment is free from any undue stress imposed by connecting piping or anchor bolts.
  - 4. Equipment has been operated under full load conditions and that it operated satisfactorily.
  - 5. Calculation of overall efficiency.

**PART 4 – MEASUREMENT AND PAYMENT**

4-1 MEASUREMENT

- A. The pumps shall not be measured for payment.

4-2 PAYMENT

- A. Compensation to the Contractor for all costs associated with the pumps shall be included in the prices bid in the schedule for Treatment Building Interior Piping, which shall include, but not be limited to all labor, materials, and equipment necessary for the installation, start-up, and operational testing of the work. No separate payment to the Contractor will be made for any work required in this section.

**END OF SECTION 11210**

**PART 1 - GENERAL**

1-1 SUMMARY

- A. This section of the specification describes the gravity drum filter systems, operational control system, and associated mounting equipment. The system shown on the drawings represents the general arrangement of the drum filter equipment. The Contractor shall provide submittal information for the Contractor's proposed drum filter equipment, with complete installation, control and dimensional information including connections, hydraulics, and internal hydraulic controls. The proposed equipment and installation shall be installed as recommended by the equipment manufacturer and shall be in compliance with all OSHA, local, state, and federal codes and regulations.

1-2 SUBMITTALS

- A. Submit in accordance with Section 01330: Submittals.
- B. Shop Drawings:
1. Submit shop drawings for each item of equipment and material in accordance with Section 01330.
  2. Drawings should include scaled plan and sections showing dimensions, weights, structural supports, embedments, clearances, and operational hydraulics and integration of the equipment in the Treatment Building process piping and the system hydraulic diagram.
  3. Installation instructions.
  4. Field test report.
- C. Operation and Maintenance Information: See Section 01770: Contract Closeout.

1-3 QUALITY ASSURANCE

- A. The drum filter system including a clean rotary screening surface, spray piping systems, filter backwash systems shall, as applicable, shall meet the requirements of the following industry standards:
1. American Society for Testing and Materials (ASTM) A 36: Standard Specification for Carbon Steel Plate
  2. American Society for Testing and Materials (ASTM) A 536-84: Standard Specification for Ferritic Ductile Iron Castings
  3. American Iron and Steel Institute (AISI) 304 Stainless Steel
  4. American Iron and Steel Institute (AISI) 4130 Heat Treated Alloy Steel
  5. American Iron and Steel Institute (AISI) 4140 Heat Treated Hexagon Steel
  6. EPA (1986) Design Manual, Municipal Wastewater Disinfection
  7. National Electrical Manufacturer's Association (NEMA) Standards
  8. National Electrical Code (NEC)
  9. Underwriters Laboratory (UL and cUL)

1-4 SITE CONDITIONS:

A. Location:

1. Approximate Elevation: 3,000 feet above mean sea level.

B. Exposures:

1. Submergence.
2. Splashing.

C. Area Weather Conditions:

1. Operating temperature range: 40 to 100°F.
2. Relative humidity range: 10 to 100 %

**PART 2 - PRODUCTS:**

2-1 ACCEPTABLE SUPPLIERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:

1. Hydrotech Model [HDF 1605-1A](#)
2. P.R.A. Manufacturing
3. Approved equal.

B. The contract drawings are based on Hydrotech [HDF 1605-1A](#). If alternate equipment is provided, the Contractor is responsible to verify and adjust as needed all affected dimensions, elevations and structural support systems to provide operation of the completed system equivalent to the original design. Any additional costs to integrate alternate equipment shall be the Contractor's responsibility. All substitutions and adjustments are subject to review and acceptance by the Engineer.

2-2 IDENTIFICATION

A. Each unit of equipment shall be identified with a corrosion resistant nameplate, securely affixed in a conspicuous place. Nameplate information shall include equipment model number, serial number, supplier's name and location.

2-3 MATERIALS

A. Drum Filter:

1. General:

- a. The drum filter shall include, but is not limited to the driveline, filter elements, drum structure, influent weir, level tank, backwash system, sludge trough, support bearings, liquid level control and high-pressure rinse system.
- b. Number of drum filters: 2

2. General Design Requirements:

- a. Each drum filter shall be designed to meet the following design requirements:

1. Minimum Flow = 300 gpm
  2. Average and Peak Flow = 3,650 gpm
  3. Spray (Backwash) Water Flow Rate = 20-25 gpm @ 100 Psig.
  4. Screen mesh size = 100 micrometers.
3. Drum Filter Rotary Screen Drum:
- a. Each Drum Filter rotary drum shall include an internally fed rotary drum, self cleaning, cylindrical solids separation screens, splash guards, drive units, backwash system.
  - b. System Configuration Requirement:  
The drum shall meet the following design and operating conditions:
    1. 95% removal of particle with size larger than 100 micrometers.
    2. The drive system shall be explosive proof, Class B, 1750-RPM motor with a 304 stainless steel cover, with VFD or soft start control.
    3. The cylinder shall be driven using a chain and sprocket arrangement.
    4. The drum construction shall be 304 stainless steel.
    5. The screen construction shall be 304 stainless steel wedge wire having accurate slots parallel to the screen axis. A polyester screen supported by a polyethylene grid may be considered as an alternate material, subject to shop drawing approval.
    6. The drum and screen shall be balanced and rotated in the shop and furnished with type 304 stainless steel ties designed to maintain the structural integrity of the complete unit.
    7. The drum filter enclosure shall be integral to the unit and shall be made of 304 stainless or glass fiber reinforced plastic material.

**B. BACKWASH SYSTEM**

1. The drum filter backwash system consists of an auxiliary backwash pump and discharge filter using water from the hatchery water system and integrated pump and discharge system using a pump and discharge filter using water from the drum filter filtrate stored in the drum filter. Both systems shall be provided and controlled by the drum filter manufacturer. The backwash system controls shall include a selection switch to select either the integrated or auxiliary pumps for operation. Both pumping systems shall supply water to the drum filter spray header system.
2. Each drum filter backwash system to be supplied by the drum filter manufacturer shall include but not be limited to: two backwash system filters (one integrated and one auxiliary), two backwash water supply pumps (one integrated and one auxiliary), backwash spray assemblies, and isolation and control valves for the integrated and auxiliary backwash systems, as indicated on the drawings.
3. Source water for the integrated backwash system shall be the drum screen filtrate water stored in the drum filter unit. The backwash system controls shall include drum filter water level feedback to provide a minimum water level in the drum filter tank to establish a required permissive operating condition prior to operation of the backwash pump.

4. Each drum filter shall be provided with one backwash pump and will provide adequate water for continuous backwash of one drum filter. The integrated backwash pump will operate upon failure of the auxiliary backwash pump and vice versa depending on the position of the pump system selection switch.
5. One standby primary pump and auxiliary pump will be provided as spare parts for the system.
6. Backwash pump suction supply pressure is approximately 2 psi.

C. ADDITIONAL REQUIREMENTS:

1. Equipment support:
  - a. Base frame to elevate unit to proper hydraulic elevation.
  - b. Inlet steel pipe end flange connections.
  - c. Spray (backwash) supply and screening discharge 304 stainless steel pipe end flange connections.
  - d. Backwash collection trough shall contain 1-inch fittings to permit flushing connection to flush additional water down backwash trough.
2. Monitors and Control Systems:
  - a. The drum filter shall be completely operated and powered through a drum filter control panel supplied by the drum filter manufacturer. The control panel shall include a hand-off-auto switch, run light, alarm lights, backwash control system, water level monitor.
  - b. In Auto operation mode the drum filter shall monitor water level and initiate a backwash when the water level in the drum rises to a user-settable backwash initiation setpoint. The backwash cycle time shall be adjustable.
  - c. The controller will include rotary speed sensor, backwash flow switch, and high water level monitor to initiate a local separate alarm conditions for each and provide contacts for sending an output alarm contact for each alarm condition. The water level for initiation of backwash and level for high water level shall be adjustable.
  - d. Water level monitors and backwash control and alarm systems.
  - e. Electrical control panel, NEMA 12 for indoor use.
  - f. Provide dry contacts for signals to the PLC for including: general fault, run mode and high water level.
  - g. Coordinate controls with Section 13450.
  - h. Contractor shall provide additional solenoid valve and timer control for trough flush. Solenoid valve shall be energized to open when drum is running in backwash mode with timer in parallel to solenoid valve energize signal. The timer shall have repeating on/off cycles with each cycle timing range from 0-5 minutes in seconds.

D. SPARE PARTS

1. Supplier shall provide the following spare parts for each unit:

- a. Recommended spare parts for one year of operation.
- b. Spare screen assemblies equivalent for replacement of 10% of the screen area.
- c. Primary Backwash pump.
- d. Auxiliary backwash pump.

**PART 3 - EXECUTION:**

3-1 PREPARATION

- A. Verify equipment and allowable headloss data and configuration of the equipment in the Treatment Building piping system prior to fabrication.

3-2 FACTORY TEST

- A. The drum filter and controllers shall be factory tested to ensure satisfactory operation.

3-3 INSTALLATION

- A. The drum filter shall be installed in accordance with the supplier's installation instructions, the project drawings and specifications, and in compliance with all OSHA, local, state, and federal codes and regulations.
- B. Vertically and horizontally align, level and plumb units into position.

3-4 FIELD QUALITY CONTROL

- A. Contractor shall provide a written statement that manufacturer's equipment has been installed properly, and is ready for testing, startup and operation procedures.
- B. Field Test:
  1. After installation of equipment, and after inspection, operation, testing and adjustments have been completed by manufacturer's service representative, manufacturer's service representative will conduct a performance test to verify each component ability to operate within the conditions as specified and indicated. Factory representative shall have complete knowledge of proper installation, operation, and maintenance of equipment supplied.
- C. Make all adjustments to place equipment in specified working order at time of above tests.
- D. Remove and replace equipment at no additional cost to the Government with equipment that will meet all requirements specified and indicated if unable to demonstrate to satisfaction of the COR that units will perform the service specified and indicated.
- E. After installation and approved testing by the COR, apply touch-up paint to all scratched, abraded and damaged shop painted surfaces. Coating type and color shall match shop painting.
- F. Equipment manufacturer shall provide the services as described above and .
  1. Inspect equipment covered by the Specification.
  2. Supervise any adjustment.
  3. Conduct startup of equipment.

4. Instruct COR's personnel for a minimum period at jobsite on operation of following:
  - a. Min. Field Inspection/Startup/Testing: One and half (1 1/2) day 1 trip  
1 trip (1 day = 8 hours at jobsite).
  - b. Min. COR's Personal Training: Half (1/2) day same trip  
(1 day = 8 hours at jobsite).

3-5 OPERATION AND MAINTENANCE INFORMATION

- A. Supplier shall provide operation and maintenance information in accordance with Section 01770: Contract Closeout.

**PART 4 – MEASUREMENT AND PAYMENT:**

4-1 MEASUREMENT

- A. Drum filters will be measured for payment per each drum filter system installed, including all labor, materials, equipment and appurtenances shown on the Drawings and approved by the COR.

4-2 PAYMENT

- A. Compensation to the Contractor for all costs associated with this item shall be made at the unit price bid in the schedule for Drum Filters, which shall include, but not be limited to all labor, materials and equipment necessary for the installation, startup and operational testing of the work.

**END OF SECTION 11305**

**PART 1 - GENERAL**

1-1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 11800, "Chemical Mixing Tank" and Section 11210 "Pumps" relate to the equipment specified in this section.

1-2 SUMMARY

- A. This Section includes the Belt Filter that is part of the wastewater treatment system for the facility. The Belt Filter is used for additional solids separation of solids-concentrated backwash water from the micro-screen drum filters.

1-3 DEFINITIONS

- A. The following are industry abbreviations:
  - 1. TEFC: Totally Enclosed Fan Cooled
  - 2. gpm: Gallons Per Minute

1-4 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of performance requirements stated in Part 2 - Products. The Belt Filter shall thicken the solids contained in the microscreen drum filter backwash flows to a 10–15% solids concentration.

1-5 SUBMITTALS

- A. Submittals shall comply with the requirements of the Construction Contract Clauses, Division 1 Section "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: Provide product data for each item in Part 2 – Products. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation instructions for each type of product indicated.
- C. Shop Drawings: Detail piping and equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 1. Schematic flow diagrams showing piping and equipment.
  - 2. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.
  - 3. Provide drawing indicating monitor locations.

- D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
- E. Maintenance Data: For systems to include in maintenance manuals specified in Division 1.
- F. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
- G. Project Record Documents: Record actual locations of piping and equipment. Revise shop drawings to reflect actual installation.

1-6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing Inclined Belt Filter equipment systems similar to that indicated for this project and with a record of successful in-service performance at this flow rate or greater. Minimum experience of at least 5 installations with an installed service record of 5 years or greater is required.
- B. Installer Qualifications: Engage personnel experienced in equipment installations similar to that required by this project who are acceptable to the Belt Filter equipment manufacturers.
- C. Provide listing/approval stamp, label, or other marking on the Belt Filter, indicating that it is made to the specified standards.

1-7 MATERIAL RESTRICTIONS

- A. The Contractor shall not install any material containing cadmium, brass, bronze, copper, zinc, or their alloys, which could come in contact with fish rearing water. These heavy metal materials have been shown to be toxic to fish.
- B. All pumps, valves, piping, wetted components, etc. that may come in contact with water shall be a material specified and approved by the CO or the Contracting Officer's Technical Representative (COTR).

**PART 2 - PRODUCTS**

2-1 BELT FILTER

- A. The Belt Filter shall be Hydrotech Model HBF 1074-1H or approved equal. The Belt Filter shall consist of an integral driveline housed inside the upper belt roller, filter belt, belt structure, tank, spray bar, backwash collection trough, overflow bypass, dewatered solids scraper assembly, liquid level control, backwash pump, and high-pressure rinse backwash control system.

1. ACCEPTABLE MANUFACTURERS

Hydrotech – Contact: Water Management Technologies, (225) 755-0026 or approved equal.

2. MANUFACTURER

Any changes to the Contract Documents required to suit the Manufacturer shall be made at no cost to the Government. Any changes in the design shall be submitted to the CO for approval.

B. GENERAL REQUIREMENTS

1. Identification

- a) Name – Belt Filter
- b) Quantity – 1

2. Operating Conditions

- a) Fluid Service – Concentrated raceway discharge with solids
- b) Fluid temperature (°F) – 33 to 77
- c) Belt Operation – Continuous screening; continuous or intermittent belt rotation and backwash on demand
- d) Installation Type – Self-contained tank with piped intake and discharge

3. Performance Requirements

- a) Min design flow capacity – 50.0 gpm
- b) Min design screen size – 300  $\mu$ m
- c) Total min filter media area – 79.7 ft<sup>2</sup>
- d) Active min filter media area – 16.14 ft<sup>2</sup>
- e) Drum drive motor – Single speed, TEFC rated, 0.18 kW, 480 volt, 3phase, 60 Hz
- f) Drive assembly – Helical worm gearmotor
- g) Backwash pump requirements – As required by Belt Filter for proper functioning of High Pressure Backwash System.

4. Key Component Dimensions

- a) Max. footprint – 13.4 ft x 3.8 ft
- b) Inlet – 6 inch ANSI Flange
- c) Clarified Water Outlet (inches) – 6-inch ANSI Flange

- d) Emergency Overflow Outlet (inches) – 6-inch ANSI Flange
- e) Backwash Water Outlet Diameter (inches) – 4-inch ANSI Flange

C. DESCRIPTION OF OPERATION

1. The drum filter backwash waste enters the interior of the belt filter via a 6 inch inlet from the Chemical Mixing Tank. Water gravity-flows through the belt filter media, while solids settle onto the belt filter element.
2. As solids are screened from the flow and collect on the belt filter media, the water level within the belt filter tank begins to rise until a "High Level" set point is reached. When this set point is reached, the liquid level control mechanism activates belt rotation via the motor on the belt filter. The portion of the belt with solids accumulation rotates to the dry section of the unit, and the solids dewater (dry).
3. Dewatered solids are scraped from the belt media after enough high water level set points are reached to turn the belt 180 degrees and the belt passes the sludge scraper assembly. A majority of solids are scraped from the belt and fall into a dewatered sludge tank.
4. The normally closed solenoid valve on the backwash supply header opens, and the high-pressure rinse system backwashes the remaining solids from the belt filter cloth into a backwash collection trough. Backwash water is supplied to the spray header by the high pressure water system. As the belt rotates, a clean portion of the belt filter is exposed to the untreated water. Thus, the water level inside the belt filter tank drops, disengaging the liquid level control mechanism to begin an off delay timer and the cycle repeats itself.
5. As the screen rotates and is cleaned, the headloss through the belt is reduced, thus reducing the water level in the belt filter tank. The filter backwash continues until either a field adjustable time interval has elapsed, or the "Normal Level" set point is reached in the belt filter. Once both of these control conditions has been reached, the backwash solenoid is closed and belt rotation is to automatically stop. The Filter then continues normal operation until the next backwash cycle begins.
6. The clarified water and backwash reject from the Belt Filter are directed to the front of the drum filters.
7. The emergency overtopping flows and a drain from the Belt Filter are directed to the dewatered sludge tank.

D. BELT FILTER CONSTRUCTION REQUIREMENTS

1. Screen Media: Shall be furnished as a continuous belt. The belt filter cloth shall be woven polyester strands. Each strand shall have a nominal thickness of 750 microns.
2. Belt Frame: The Belt structure shall be on a 10 degree and shall be a one-piece welded structure of 304 stainless steel. 24 support members shall support the belt element. A rubber lip on both sides of the belt filter cloth shall separate untreated water from filtered water. The belt filter shall be constructed in such a manner that permits one to remove the belt structure assembly with the Belt Filter lifting device accessory to service and maintain the lower cavity of the belt filter.

3. Backwash Spray Header: Each Belt Filter shall be furnished with one backwash spray header complete with automatic self-cleaning nozzles. The backwash spray header piping shall be furnished with a ball valve / tee assembly and necessary fittings to allow for flushing of the header and shall include a normally closed, powered open 304 stainless steel solenoid for automatic control of backwash water. The entire spray bar assembly shall be removable for ease of service. The spray bar shall have 12 nozzles per 1.0 m of belt filter element width with overlapping coverage. The rinse water connection shall be 0.75 inches in diameter. Quick release nozzle tips shall be used for easy cleaning and maintenance. The quick release nozzle caps shall be made of nylon with an EPDM gasket and stainless steel spray tip.
4. Belt Drive Motor: Shall be controlled by a VFD controller. The motor shall have a corrosion resistant epoxy coating and corrosion resistant hardware.
5. Inlet Channel: The Belt Filter shall have a 6 inch ANSI flanged inlet manufactured from 304 SS. The Belt Filter inlet shall connect to the effluent 6 inch ANSI Flange outlet of the Chemical Mixing Tank.
6. Overflow Bypass: An overflow bypass shall be integral with the belt filter and shall permit untreated water to bypass the filter untreated in the event of a mechanical failure. The 6-inch ANSI Flange diameter overflow bypass outlet shall be located below the inlet channel to the Belt Filter.
7. Backwash Trough: The trough shall be manufactured from 304 stainless steel, and shall be capable of capturing backwash water and solids from the belt filter cloth.
8. Backwash Spray Header: The header shall be designed to automatically deliver a total backwash flow of 0.8 L/s (12.7 USgpm) at a minimum nozzle supply pressure of 7.5 bar (109 psi).

E. BELT FILTER CONTROLS AND INSTRUMENTATION

1. The Belt Filter shall be furnished by the Manufacturer with a Local Control Panel (LCP), which houses all electrical components in a NEMA 4X enclosure. The LCP shall be equipped with a three-way "Hand- Off -Auto" selector switch that simultaneously controls both the backwash solenoid and the belt drive motor. Backwash in the "Auto" mode will be stopped by whichever of these signals occurs first:
  - a) "Hand" Setting: Operator selection of the "Hand" mode will result in continual rotation of the belt and backwashing of the belt filter media via continual operation of the belt drive motor and the opening of the backwash solenoid respectively.
  - b) "Off" Setting: The "Off" mode does not allow the respective backwash solenoid to open or the belt drive motor to operate.
  - c) "Auto" Setting: Operator selection of the "Auto" mode will result in intermittent backwashing (drive motor operation) based upon an input signal sent to the Local Control Panel from the Belt Filter Tank Level Sensor. Backwashing is to commence when water level in the tank reaches a "high level" set point on the level sensor. In the "Auto" mode, the backwash solenoid shall be closed when the tank water level recedes to the normal submergence level (as communicated to the control panel

by a “low level” set-point on the level sensor), or when a preset time delay interval (operator adjustable from 2 to 30 seconds) expires.

2. Belt Filter Inlet Tank Level Sensor: A level sensor shall be supplied in the belt filter tank and wired to the respective Local Control Panel by the Belt Filter Manufacturer. The level sensor shall be a magnetic float switch type. The level sensor model shall be determined by the Manufacturer, but shall be guaranteed for a minimum service of 3 years. Elevation of the level sensor shall be field adjustable.
3. Variable Frequency Drive (VFD) Controller: The VFD controller shall be housed in the LCP and is to control the Belt Drive Motor to ramp-up the belt rotation from standing to full rotational speed upon initiation of belt rotation. The VFD will also ramp-down the belt rotation from full rotational speed to a stop upon cessation of the automatic backwash sequence or through manual “Hand” and “Off” signals from the Local Control Panel. Rotational speed ramp-up and ramp-down should occur over an approximately 10–15 second time period.

F. NUTS, BOLTS WASHERS

1. Nuts, bolts, washers and threaded rod shall be 304 stainless steel. Hanger and pipe supports shall be 304 stainless steel.

G. SPARE PARTS

1. The following spare parts will be provided for the Belt Filter:
  - a) One spare Belt, complete with associated stainless steel fasteners for future repair needs.
  - b) One complete set of backwash nozzle assemblies.
  - c) One 304 stainless steel solenoid valve.

**PART 3 - EXECUTION**

3-1 EXAMINATION

- A. All parts of the Belt Filter shall be properly designed and built for stresses that may occur during fabrication, shipping, installation, and intermittent or continuous operation. Workmanship shall be of high industrial standard in all respects.
- B. The Belt Filter shall come with a Manufacturer’s warranty covering both parts and labor for a period of at least one year.

3-2 INSTALLATION

- A. Install the Belt Filter and associated equipment in accordance with the Manufacturer’s instructions.
- B. Belt Filter Local Control Panel Installation, General

1. The Belt Filter Local Control Panel shall be pedestal-mounted and all control cabling shall be run in conduit between the control panel and the Float Switch Assembly located in the Belt Filter inlet chamber and the Solenoid Valve located on the high-pressure backwash water supply.

### 3-3 FIELD QUALITY CONTROL

#### A. Inspect the Belt Filter as follows:

1. Do not enclose, cover, or put the Belt Filter into operation until it is inspected and approved by the Government.
2. During installation, notify the Government at least 24 hours before inspection must be made. Perform the tests specified below in the presence of the Government's representative.

#### B. Test the Belt Filter as follows:

1. Test the Belt Filter for leaks, defects and compliance with performance requirements in both "manual" and "automatic" modes. If testing is performed in segments, submit a separate report for each test, complete with a diagram of the portion of the Belt Filter tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced water piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.
3. Repair leaks and defects with new materials and retest the Belt Filter or portion thereof until satisfactory results are obtained.
4. Prepare reports for tests and required corrective action.

### 3-4 CLEANING

#### A. Clean and disinfect the Belt Filter as follows:

1. Purge new the Belt Filter and parts of existing water piping that have been altered, extended, or repaired before using.
2. Clean the interior of the Belt Filter. Remove dirt and debris as work progresses.

### 3-5 COMMISSIONING

#### A. Field Testing

1. Upon completion of the installation, each piece of equipment and each system shall be tested for satisfactory operation and compliance with performance requirements without excessive noise, vibration, overheating, etc. All equipment shall be adjusted and checked for alignment, levelness, clearances, supports, and adherence to safety standards, until found satisfactory. This work will be performed by a qualified representative of the Manufacturer, who will be on hand at startup for a minimum of 2 days. Complete testing of the backwash system shall be performed by the Manufacturer on-site and shall be demonstrated in the

presence of the Contracting Officer before final acceptance of the system is given.

- B. Training
  - 1. Provide 4 hours of on-site training to hatchery staff. Training shall include operation, maintenance, and programming as required. Training shall occur after operating and maintenance manuals have been approved.

**PART 4 - MEASUREMENT AND PAYMENT:**

4-1 MEASUREMENT

- A. Belt Filter will be measured for payment per each Belt Filter installed, including all labor, materials, equipment and appurtenances shown on the Drawings and approved by the COR.

4-2 PAYMENT

- A. Compensation to the Contractor for all costs associated with this item shall be made at the unit price bid in the schedule for Belt Filter, which shall include, but not be limited to all labor, materials and equipment necessary for the installation, startup and operational testing of the work.

**END OF SECTION 11550**

**PART 1 - GENERAL**

1-1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Equipment specified in Section 11550, Belt Filter.

1-2 SUMMARY

This Section includes:

- A. The Chemical Mixing Tank that is used before the Belt Filter for increasing solids separation of solids-concentrated backwash from the drum filters. The system consists of a Chemical Mixing Tank with inclusive mixers.
- B. Two all-inclusive, skid-mounted, pre-engineered Chemical Dosing Systems for alum and polymer addition to the Chemical Mixing Tank with dual metering pumps.

1-3 DEFINITIONS

- A. The following are industry abbreviations:
  - 1. gpm: Gallons Per Minute
  - 2. L/s: Liters Per Second
  - 3. HP: Horsepower
  - 4. spm: strokes per minute

1-4 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of performance requirements stated in Part 2 - PRODUCTS.

1-5 SUBMITTALS

- A. Submittals shall comply with the requirements of the Construction Contract Clauses, Division 1 Section "Submittals" and the individual sections specifying the work.
- B. Product Data: Provide product data for each item in Part 2 – Products. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation instructions for each type of product indicated.
- C. Shop Drawings: Detail piping and equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 1. Schematic flow diagrams showing piping and equipment.

2. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.
  3. Provide drawing indicating monitor locations.
- D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
- E. Maintenance Data: For systems to include in maintenance manuals specified in Division 1.
- F. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
- G. Project Record Documents: Record actual locations of piping and equipment. Revise shop drawings to reflect actual installation.

1-6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing Chemical Mixing Tank equipment systems and dosing systems similar to that indicated for this project.
- B. Installer Qualifications: Engage personnel experienced in equipment installations similar to that required by this project who are acceptable to the Chemical Mixing Tank equipment and Dosing System manufacturers.
- C. Provide listing/approval stamp, label, or other marking on the Chemical Mixing Tank and Dosing Systems, indicating that it is made to the specified standards.

1-7 MATERIAL RESTRICTIONS

- A. The Contractor shall not install any material containing cadmium, brass, bronze, copper, zinc, or their alloys, which could come in contact with fish rearing water. These heavy metal materials have been shown to be toxic to fish.
- B. All pumps, valves, piping, wetted components, etc. that may come in contact with water shall be a material specified and approved by the CO or the CO's Technical Representative (COTR).

**PART 2 - PRODUCTS**

2-1 CHEMICAL MIXING TANK (Polymer/Coagulant System PT 500)

- A. The Chemical Mixing Tank shall be Hydrotech Model HMT 1000 or approved equal. The Chemical Mixing Tank shall be a 316 stainless steel tank with liquid level control system. The tank shall be separated into three chambers. Each chamber shall have a propeller-type mixer.

1. MANUFACTURER

Hydrotech – Contact: Water Management Technologies, (225) 755-0026 or approved equal

Any changes to the Contract Documents required to suit the Manufacturer shall be made at no cost to the Government. Any changes in the design shall be submitted to the CO for approval.

B. GENERAL REQUIREMENTS

1. Identification
  - a) Name – Chemical Mixing Tank
  - b) Equipment Number – PT 500
  - c) Quantity – 1
2. Operating Conditions
  - a) Fluid service – Freshwater with 0.5% solids content
  - b) Fluid temperature – 33 to 77 degrees F
  - c) Operation – Continuous or intermittent mixing
  - d) Installation Type – Self-contained tank with piped intake and channel discharge
3. Performance Requirements
  - a) Design flow capacity – 50.0 gpm
  - b) Mixer motors – Variable speed, 460 volt, 3 phase, 60 Hz
4. Key Component Dimensions
  - a) Capacity – 348.7 gallons
  - b) Max. footprint – 9.02 x 2.79 ft
  - c) Inlet – 4.0-inch diameter ANSI flange
  - d) Outlet (inches) – 6.0 inch diameter ANSI Flange

C. DESCRIPTION OF OPERATION

1. The Chemical Mixing Tank is used to pre-treat backwash water from the microscreen drum filters. Standard operation of the Chemical Mixing Tank is as follows:
  - a) Solids laden backwash water from the drum filters is pumped to the Chemical Mixing Tank from a sludge equalization tank.
  - b) The sludge equalization pump delivers a constant sludge water flow rate (up to 50 gpm) to the first chamber of the chemical mixing tank (HMT 1000).
  - c) As backwash water enters the first chamber of the Chemical Mixing Tank, a proportional amount of 1% alum slurry stock solution is pumped into the first chamber to produce an alum concentration of 50 mg/L. The alum is continuously mixed into the wastewater using a slow speed, variable speed mixer that is mounted at the top of the first chamber of the mixing tank. The first chamber of the mixing tank is approximately 0.28 m<sup>3</sup> (74 gallon) in volume.
  - d) The process stream then flows over a weir into the small (approximately 0.02 m<sup>3</sup> (5.3 gal) volume) middle chamber of the mixing tank. A polymer is added to the middle chamber at 0.2% to produce a polymer concentration of 2.5 mg/L; and subsequently mixed into the waste stream using a high speed, variable speed mixer to flocculate solids in the waste stream.
  - e) The waste stream then flows into the last chamber of the mixing tank, where it is continuously mixed with a slow speed, variable speed mixer. The last chamber of the mixing tank is approximately 0.56 m<sup>3</sup> (148 gallon) in volume.
  - f) The pretreated backwash waste stream with large flocculated solids exits the last chamber of the mixing tank through the effluent outlet and flows into the Belt Filter inlet.
2. The chemical mixing tank operations has to be coordinated with operation of chemical dosing systems (DS-1 and DS-2) and belt filter.

D. CHEMICAL MIXING TANK CONSTRUCTION REQUIREMENTS

1. Housing: The tank shall be of a watertight, one piece construction from 316 stainless steel. The tank shall have integral support bars at the top to support the three mixers.
2. Mixer Motors: Each of three variable speed mixer motors shall be controlled by a variable frequency drive motor controllers housed in the control panel.

3. Bypass Piping: Bypass piping and valving shall be incorporated into the mixing tank design to permit untreated water to bypass the tank untreated in the event of a mechanical failure in the mixing tank.

E. CHEMICAL MIXING TANK CONTROLS

1. The Chemical Mixing Tank shall be furnished by the Manufacturer with a Local Control Panel (LCP), which houses all electrical components in a NEMA 4X enclosure. The LCP shall be equipped with three 3-way "Hand- Off -Auto" selector switches that control the mixer drive motors. Each switch shall control its respective mixer as follows:
  - a) "Hand" Setting: Operator selection of the "Hand" mode will result in continual operation of the mixer drive motor.
  - b) "Off" Setting: The "Off" mode does not allow the respective mixer to operate.
  - c) "Auto" Setting: Operator selection of the "Auto" mode will result in intermittent operation of the middle chamber mixer based upon an input signal sent to the Local Control Panel from the sludge equalization tank pump and continuous operation of the mixers for the first and last chambers.
2. Variable Frequency Drive (VFD) Controllers: Three VFD controllers shall be supplied to independently adjust the speed of each of the three mixers in the Chemical Mixing Tank. The VFD controllers for the first and last mixer motors shall provide a mixing speed that can be adjusted from approximately 30 to 120 rpm. The middle mixer motor – used for flash mixing of polymer – shall provide a mixing speed that can be adjusted from approximately 400 to 1,600 rpm. All VFD controllers shall be housed in the Chemical Mixing Tank Local Control Panel.

F. NUTS, BOLTS, WASHERS, AND PIPE SUPPORTS

1. Nuts, bolts, washers, threaded rod, hangers and pipe supports shall be 304 stainless steel.

G. SPARE PARTS

1. No spare parts are required.

2-2 CHEMICAL DOSING SYSTEMS (DS-1 & DS-2)

- A. The Chemical Dosing System shall be all-inclusive, skid-mounted, pre-engineered dosing systems, each with dual metering pumps, as manufactured by Milton Roy USA, or approved equal. The pumps shall be microprocessor controlled, simplex, motor driven, reciprocating, mechanically-actuated diaphragm type pumps. The pumps shall include integral motor with permanently lubricated gear reducer, cam-and-spring drive mounted.

1. MANUFACTURER

Milton Roy USA, Pulsafeeder Inc, ProMinent, or approved equal – Contact: Water Management Technologies, (225) 755-0026

Any changes to the Contract Documents required to suit the Manufacturer shall be made at no cost to the Government. Any changes in the design shall be submitted to the CO for approval.

B. GENERAL REQUIREMENTS

1. Identification – Alum Dosing System

- a) Name – Alum Chemical Dosing System
- b) Equipment Number – DS-1 with Alum Dosing Pumps ADP-1 & ADP-2
- c) Quantity – 2 pumps per dosing system (1 operational, 1 standby)

2. Identification – Polymer Dosing System

- a) Name – Polymer Chemical Dosing System
- b) Equipment Number – DS-2 with Polymer Dosing Pumps PDP-1 & PDP-2
- c) Quantity – 2 pumps per dosing system (1 operational, 1 standby)

3. Operating Conditions

- a) Fluid service – 1% alum solution  
– 0.2% polymer solution
- b) Fluid temperature – 33 to 77 degrees F
- c) Operation – Continuous or intermittent
- d) Pumping capacity – 20.6 GPH alum pump  
– 4.5 GPH polymer pump

4. Electrical

- a) Power requirements – 115 VAC, 60Hz, 1 phase

C. CONSTRUCTION REQUIREMENTS

- 1. Each Dosing System skid shall contain the following:

- a) Skid with drip lip
  - b) Metering pumps with manual stroke length adjustment
  - c) Calibration column
  - d) Pulsation dampeners
  - e) Pressure gauges with diaphragm seals
  - f) Ball valves
  - g) Pressure relief valves
  - h) Backpressure valves
  - i) All piping, valves, gaskets, supports, hardware, wiring, and accessories necessary for a fully functioning skid
2. Each chemical dosing system shall be completely assembled, mounted, calibrated, tested, and delivered to the site on a single skid. Components to be mounted on the skid are as indicated on the drawings and shall include the metering pumps (ADP-1, ADP-2, PDP-1, PDP-2), calibration column, piping, valves, piping accessories (pulsation dampeners, strainers, etc.), and wiring integral to the skid. The chemical dosing system supplier shall be responsible for providing all equipment, valves, piping and appurtenances within the skid boundary. The Contractor shall coordinate the layout and design of the skid to match the project and the site requirements.
  3. The liquid end of the pump shall be physically separated from the drive unit by a backplate with weep hole, creating an air gap. An elastomer shaft wiper seal shall prevent contamination of the gear box by confining the chemical within the back plate if the primary diaphragm fails. The primary diaphragm shall be constructed of a steel core, vulcanized into nylon-reinforced EPDM backing, with PTFE-faced fluid contact surface.
  4. The pump diaphragm shall be of a convex design fitting into a concave liquid end to minimize diaphragm wear, liquid and dead volume, and to promote solids in suspension.
  5. The polymer pumps shall be capable of handling high viscosity fluids, up to 3500 cps.
  6. The alum and polymer pumps' liquid end shall be constructed of PVDF, with PVDF valves. No other materials of construction shall be acceptable. The suction and discharge valves shall include ceramic oxide balls; the valves shall be spring loaded with 1 psig springs to allow for positive seating of the valve ball.
  7. The pump shall have a NEMA 4 enclosure rating.
  8. The skid shall be constructed of fusion welded polypropylene sheets with adequate supports for all equipment and piping. Fork lift truck cut outs shall be provided.
  9. All components of the skid-mounted system shall be tested prior to shipment as follows:
    - a) Tests shall be conducted on the actual dosing pumps and skids being provided for the project.

- b) The test can be performed with water. The system shall be operated throughout the entire operating range of the dosing pumps.
- c) All piping shall be hydrostatically tested to a pressure of 150 psig without leakage. Documented testing results shall be provided.

D. CALIBRATION CHAMBER

1. The skid shall have a clear plastic calibration chamber with vent for use in calibrating the dosing pumps. The chamber shall be sized to give adequate capacity for a minimum 60 seconds drawdown test. The scale shall give direct readings in GPH without the need for calculations.
2. The calibration chamber shall be piped and valved so that each pump can utilize the calibration chamber without interfering with the operation of the other pump. The top of the chamber shall have a threaded fitting to allow for piping to a common vent.

E. PULSATION DAMPENERS

1. One pulsation dampener with integral pressure gauge shall be provided on the discharge side of each dosing pump.
2. Pulsation dampener shall be of the single diaphragm design, capable of arresting water hammer in the pump discharge lines created by the dosing pumps. Pulsation dampener shall dampen flow a minimum of 95 percent.
3. Pulsation dampener shall be provided with valves, gauges, and fittings necessary for a maintaining required air pressure in the air chamber.
4. Materials of construction of the diaphragm and body shall be corrosion resistant to the chemical fluid pumped.

F. PIPING, VALVES, AND APPURTENANCES

1. Skid pipe and accessories shall be Schedule 80 PVC with socket ends. Cement shall be as recommended by the pipe manufacturer for the service outlined in this Section. The calibration column shall be clear PVC.
2. True-union ball valves shall be utilized. Isolation valves shall be provided at all equipment connections. Seals shall be compatible with the chemical being pumped.

G. BACK PRESSURE AND PRESSURE RELIEF VALVES

1. One back pressure and one pressure relief valve shall be provided for each dosing pump.
2. Valves shall be spring-loaded, diaphragm type, with materials of construction compatible with chemical being pumped.

H. NUTS, BOLTS, WASHERS, AND PIPE SUPPORTS

1. Nuts, bolts, washers, threaded rod, hangers and pipe supports shall be 304 stainless steel.

I. ACCESSORIES – ALUM SYSTEM

1. A 360-gallon polyethylene tank (48-in in diameter and ~53.25 in high) shall be provided with:
  - a) A mixer – A mixer shall be designed to accommodate the liquid viscosity and the size of the tank. Mixer shall be Neptune JD-3.0 permanently lubricated gear drive mixer with 316 stainless steel propellers and shaft, or approved equal. Mixer motor shall be single speed, TEFC, 1/3 HP, 1 phase, 115/230 volts. Shaft shall be appropriately trimmed by the mixer manufacturer to fit into the tank. The mixer shall have an adjustable angle of entry by indexed ball-and-socket design to achieve various process results. The mixer shall have clamp-on mount on the floor stand.
  - b) A floor stand – Floor stand shall sit on the finished floor of the treatment building. The floor stand shall be made of heavy duty steel with corrosion resistant coating, and shall have an agitator mounting support to accommodate mounting the gear drive mixer within the tank.
  - c) A fitting for connection to the chemical dosing system.
2. The tank shall be equipped with a funnel or other appropriate arrangement for wetting the alum during the preparation of the stock feed solution.
3. Contractor shall coordinate with Chemical Mixing Tank and Dosing System supplier and provide the amount of chemical required for a start-up and for 4 weeks of normal operations.

J. ACCESSORIES – POLYMER SYSTEM

1. A 55-gallon polyethylene tank (22-in in diameter and ~37.25 in high) shall be provided with:
  - a) A mixer - A mixer shall be designed to accommodate the liquid viscosity and the size of the tank. Mixer shall be Neptune JG-2.0 permanently lubricated gear drive mixer with 316 stainless steel propellers and shaft, or approved equal. Mixer motor shall be single speed, TEFC, 1/3 HP, 1 phase, 115/230 volts. Shaft shall be appropriately trimmed by the mixer manufacturer to fit into the tank. The mixer shall have an adjustable angle of entry by indexed ball-and-socket design to achieve various process results. The mixer shall have clamp-on mount on the floor stand.
  - b) A floor stand – Floor stand shall sit on the finished floor of the treatment building. The floor stand shall be made of heavy duty steel with corrosion resistant coating, and shall have an agitator mounting support to accommodate mounting the gear drive mixer within the tank.
  - c) A fitting for connection to the chemical dosing system
2. Contractor shall coordinate with Chemical Mixing Tank and Dosing System supplier and provide the amount of chemical required for a start-up and for 4 weeks of normal operations.

K. SPARE PARTS

1. Provide spare parts for all equipment as recommended by the manufacturer for one year of service.

**PART 3 - EXECUTION**

3-1 EXAMINATION

- A. All parts of the Chemical Mixing Tank and Dosing System shall be properly designed and built for stresses that may occur during fabrication, shipping, installation, and intermittent or continuous operation. Workmanship shall be of high industrial standard in all respects.
- B. The Chemical Mixing Tank and Dosing System shall come with a Manufacturer's warranty covering both parts and labor for a period of one year minimum.

3-2 INSTALLATION

- A. Install the Chemical Mixing Tank and Dosing System and associated equipment in accordance with the Manufacturer's instructions.

3-3 FIELD QUALITY CONTROL

- A. Inspect the Chemical Mixing Tank as follows:
  1. Do not enclose, cover, or put the Chemical Mixing Tank and Dosing System into operation until it inspected and approved by the Government.
  2. During installation, notify the Government at least 24 hours before inspection must be made. Perform the tests specified below in the presence of the Government's representative.
- B. Test the Chemical Mixing Tank as follows:
  1. Test the Chemical Mixing Tank and Dosing System for leaks, defects and compliance with performance requirements in both "manual" and "automatic" modes. If testing is performed in segments, submit a separate report for each test, complete with a diagram of the portion of the Chemical Mixing Tank tested.
  2. Repair leaks and defects with new materials and retest the Chemical Mixing Tank and Dosing System or portion thereof until satisfactory results are obtained.
  3. Prepare reports for tests and required corrective action.

3-4 CLEANING

- A. Clean and disinfect the Chemical Mixing Tank and Dosing System as follows:

1. Purge the Chemical Mixing Tank and Dosing System and parts of existing water piping that have been altered, extended, or repaired before using.
2. Clean the interior/exterior of the Chemical Mixing Tank and Dosing System. Remove dirt and debris as work progresses.

3-5 COMMISSIONING

A. Field Testing

1. Upon completion of the installation, each piece of equipment and each system shall be tested for satisfactory operation and compliance with performance requirements without excessive noise, vibration, overheating, etc. All equipment shall be adjusted and checked for alignment, levelness, clearances, supports, and adherence to safety standards, until found satisfactory. This work will be performed by a qualified representative of the Manufacturer, who will be on hand at startup for a minimum of 2 days. Complete testing of the Chemical Mixing Tank and Dosing System shall be performed by the Manufacturer on-site and shall be demonstrated in the presence of the CO before final acceptance of the system is given. A second site visit shall be provided approximately 4 months after the first site visit.

B. Training

1. Provide 8 hours of on-site training to hatchery staff. Training shall include operation, maintenance, and programming as required. Training shall occur after operating and maintenance manuals have been approved.

**PART 4 - MEASUREMENT AND PAYMENT:**

4-1 MEASUREMENT

- A. Chemical Mixing Tank and Dosing System will be measured for payment per each system installed, including all labor, materials, equipment and appurtenances shown on the Drawings and approved by the COR.

4-2 PAYMENT

- A. Compensation to the Contractor for all costs associated with this item shall be made at the unit price bid in the schedule for Chemical Mixing Tank and Dosing System, which shall include, but not be limited to all labor, materials and equipment necessary for the installation, startup and operational testing of the work.

**END OF SECTION 11800**