

## SECTION 11250

### PACKAGE WASTEWATER TREATMENT PLANT EQUIPMENT AND MECHANICAL

#### PART 1: GENERAL

##### 1.01 SCOPE OF WORK

- A. Furnish and install at the (fill in name) Wastewater Treatment Plant site all equipment, appurtenances, and pre-cast concrete walls to complete and make ready for operation a package wastewater treatment plant as shown on the Drawings. The equipment under this section will include all clarifier equipment and basin walls, main bridge, torque tube, rake, squeegees, skimmer arms, drive, weirs, and internals; aeration basin precast walls and equipment including diffusers, piping, electric motor-driven air blowers, air lift pumps, junction boxes, flow meters and controls; all piping and valves located within the process structure as shown on the Drawings; all equipment, appurtenances, and pre-cast concrete walls associated with the aerated sludge holding tank including diffusers, piping, pipe supports, and WAS junction boxes; all equipment, appurtenances, and pre-cast concrete walls associated with the flow equalization (EQ) tank including diffusers, pipe supports, flow junction boxes, piping, influent screening, and flow equalization pumps; all lighting; all metal grating, handrails, walkways, stairs, and scaffolding shown within the process structure as shown on the Drawings.
- B. The system will be furnished complete, including all materials and equipment, all fasteners and bolts, any required materials for fastening the concrete walls and tank sections to the concrete slab, plus any items required inside or on top of the structures. The equipment supplier will be responsible for the design and system integrity of the process in accordance with the design criteria established in this specification, and for the fabrication of the equipment to provide a fully functioning and complete process, complete with all required coatings, electrical equipment, and controls.

##### 1.02 RELATED WORK

- A. Site work is included in Division 2.
- B. Concrete work is included in Division 3.
- C. Miscellaneous metals are included in Division 5.
- D. Painting is included in Division 9.
- E. Gates are specified in Division 11.
- F. Piping, valves, and appurtenances are included in Division 15.
- G. Electrical work is included in Division 16.

##### 1.03 SUBMITTALS

- A. The Contractor shall submit drawings and other data to the Engineer per Section 01300. Drawings and other data shall be complete, prepared especially for this Project. Manufacturer's standard drawings will not be accepted.

- B. Submittals shall include but not necessarily be limited to:
1. Shop drawings and product data showing materials of construction and installation details for blower, motors, valves, pressure gages and switches, temperature gages and temperature switches, expansion joints, vibration sensors.
  2. Drawings showing dimensions of all equipment units and spacing of structural supports.
  3. A list of the manufacturer's recommended spare parts. Include gaskets, packing, etc. on the list.
  4. Control details and electrical wiring diagrams.
  5. Performance data and curves for all equipment. The data shall include, but not be limited to, the following:
    - a. Certified oxygen transfer performance curves
    - b. Certified diffuser and air distribution headloss calculations
    - c. Certification of sludge collector drive torque requirements
    - d. Airlift pump curves
    - e. Materials listing
  6. The Contractor shall submit performance curves for each blower, complete with noise level data with and without the provided sound proof enclosures. The performance curves shall be based on data established by tests in accordance with the latest edition of the ASME Power Test Code for Centrifugal Compressors, and shall include the following information:
    - a. Manufacturer's name and address
    - b. Model number and generic type
    - c. RPM
    - d. ICFM
    - e. Discharge pressure PSIG
    - f. Inlet pressure PSIA
    - g. Inlet temperature °F (°C)
    - h. Discharge temperature °F (°C)
    - i. Relative humidity
    - j. Brake horsepower required at specified capacity and pressure
    - k. Bearing types and B-10 life in hours
    - l. Lubrication systems
  7. The Contractor shall submit performance tests for each motor, complete with noise level data.
  8. The Contractor shall submit for each intake filter, data sheet(s) including the following information:
    - a. Manufacturer's name and address
    - b. Model number and generic type
    - c. ACFM
    - d. Pressure drop
    - e. Element type

- f. Removal efficiency and particle size
  - g. Materials of construction
9. The total weight of each blower, including the weight of the single largest item or component.
  10. Operations and maintenance data for all equipment per Section 01730.
  11. Submit a Statement of Qualifications.
  12. Submit a manufacturer's field report, including a report of installation, inspection, testing and observations.
  13. All other information necessary to enable the Engineer to determine whether the proposed equipment meets specified requirements.

#### 1.04 REFERENCE STANDARDS

- A. American Society of Mechanical Engineer (ASME)
  1. Section IX – Welding and Brazing Qualifications, latest edition.
- B. American Institute of Steel Construction (AISC)
  1. Specifications for Design, Fabrication and Erection of Structural Steel for Buildings, latest edition.

#### 1.05 QUALITY ASSURANCE

- A. All appurtenant equipment included in this Specification shall be furnished by a single supplier having at least five years experience in design and construction of package wastewater treatment plants similar in size to this Project. A list of such installations identifying the user's name, address and telephone number shall be submitted to the Engineer.
- B. The supplier of all pre-cast concrete tanks/structures and equipment within the Process Structure shall be wedotanks.com, LLC or Engineer-approved equal.
- C. Services of Manufacturer's Representative
  1. A manufacturer's factory representative for the process equipment who has complete knowledge of proper installation, start-up, and operation and maintenance (O&M) shall be provided as noted below and in accordance with Section 01170. The blower manufacturer shall also supply the services indicated below for the blowers.

2. Man-hour requirements tabulated below are exclusive of travel time and do not relieve the Contractor of obligation to provide sufficient service to place equipment in satisfactory operation.

Services Provided by Factory Representative	Minimum <sup>(a)</sup> No. of Trips	Minimum Time On Site Per Trip (hours)
1. Supervise installation	1	8
2. Inspect and approve installation <sup>(b)</sup>	1	8
3. Supervise initial adjustment <sup>(c)</sup>	(c)	8
4. Supervise and assist in testing <sup>(d)</sup>	(d)	8
5. Instruct Owner and Engineer in proper start-up and O&M <sup>(e)</sup>	(e)	8

- (a) The manufacturer's factory representative shall be present at frequent enough intervals to ensure proper installation, testing, and initial operation of the equipment.  
 (b) The manufacturer's factory representative shall provide to the Engineer a written certification that the system has been installed in accordance with the manufacturer's recommendations.  
 (c) May be done upon completion of Item 2 if acceptable to the Engineer.  
 (d) May be done upon completion of Items 2 and 3 if acceptable to the Engineer.  
 (e) Instruction may be given upon completion of Item 4, provided that the test is successful and the O&M manuals have been submitted to and accepted by the Engineer.

## 1.06 SYSTEM DESCRIPTION

### A. General

- The package wastewater treatment plant (WWTP) shall receive raw influent from the owners influent pump station or gravity sewer. The package WWTP shall include a flow equalization basin (1 or 2 basins), two (2) aeration basins to biologically treat the influent, secondary clarification (2 clarifiers) to remove waste activated sludge and provide return activated sludge, and provide aerobic sludge digestion/ sludge holding. Secondary effluent will flow to a cloth disc filtration unit provided by others. Filtered effluent will flow to the existing ultraviolet (UV) disinfection system. The package wastewater treatment plant effluent shall meet discharge permit requirements for the specified flows.
- The design criteria for the package wastewater treatment plant are as follows:

Influent Parameters (fill in values)

Value	Flow	BOD <sub>5</sub>		TSS		TN	
	gpd	ppd	mg/L	ppd	mg/L	ppd	mg/L
Max Month Design							
Max Day Design							
Peak Hour							

Effluent Permit Requirements (fill in values)

Effluent Characteristics	Limits		
	Monthly Average	Weekly Average	Daily Maximum
Flow			
BOD, 5-day (April 1–October 31)			
BOD, 5-day (November 1–March 31)			
TSS			
NH <sub>3</sub> as N (April 1–October 31)			
NH <sub>3</sub> as N (November 1–March 31)			

1.07 DELIVERY, STORAGE AND HANDLING

- A. Materials shall be delivered to the job site, marked for proper installation as close to the time of erection as possible, but in no case shall any materials or equipment be delivered more than 60 days prior to scheduled erection/installation.
- B. Material stored at the job site shall be stacked above the ground and adequately supported and protected to prevent rusting, damage, warping or other deterioration that will reduce the cross-sectional area or change the shape of the material.
- C. Materials shall be handled with adequately designed lifting devices and in a manner that will not cause undue stress to the material.

1.08 MAINTENANCE

- A. All special tools required for normal operation and maintenance of the equipment shall be furnished with the equipment. One complete set of equipment manufacturer's recommended spare parts shall be provided. As a minimum, the following spare parts shall be provided.
  - 1. One (1) complete set of air filter elements for the air filters.
  - 2. One (1) set of specialty tools as furnished by manufacturer.
- B. All tools will be placed in a steel tool box with clasp and lock, and spare parts shall be properly packed and protected for long-term storage and placed in containers clearly identified in indelible markings as to contents.

PART 2: PRODUCTS

2.01 PACKAGE WASTEWATER TREATMENT PLANT

- A. The following items of equipment shall be included:
  - 1. Air distribution piping, including diffusers, air control valves, air drop pipes, and pipe supports.
  - 2. Blowers and sound-proof enclosures
  - 3. Flow control weirs and valves

4. Access stairway
5. Walkways with OSHA approved railings
6. Sludge drive and collection mechanism
7. Miscellaneous internal piping and valves
8. Flow distribution boxes
9. Air lift pumps
10. Instrumentation and controls
11. Tank walls and structures
12. Mechanical clarifier sludge and scum collection mechanisms
13. All other items required within tank wall limits and above the concrete floor slab with the exception of electrical wiring not included with equipment or controls

2.02 PRECAST CONCRETE TANK WALLS AND BASE SLAB

Shall be provided according to Section 11250-Precast Concrete Tank System

2.03 FLOW EQUALIZATION

A. Basin

1. A flow equalization basin shall be a single or dual basin configuration with a total volume of (insert volume) gallons.
2. The basin(s) shall receive flow from the influent pump station or owners gravity sewer, scum discharge from secondary clarification, decant from the Sludge Holding Tank, and filter backwash.
3. The basin(s) shall have two overflow weir notches (1 for each Aeration Basin) located 6 inches below the top of wall elevation fabricated into the divider wall separating the EQ basin and the Aeration Basin. Overflow notches shall convey flow to the Aeration Basins in the event that the equalization pumps fail.
4. The interior basin walls shall be coated with a material suitable for preventing hydrogen sulfide corrosion.

B. Flow Distribution Box and Influent Screening

1. Influent flow from the influent pump station shall be screened with a manual influent bar screen with a bar separation of 0.5 inch prior to entering the flow distribution box. Bars shall be stainless steel. Screenings from the bar screen shall be collected in a removable screenings basket that can be easily accessed from the walkway. Influent screening box and bar screen shall be designed so owner install a mechanically cleaned bar screen at a later date that will comply with 10 States Standards requirements.
2. Flow from the screening channel shall enter a flow distribution box with two (2) V-notch weirs that distribute flow to the Aeration Basins. Angle of V-notch weirs shall be provided by the manufacturer and approved by engineer prior to installation. V-notch weirs shall be fabricated such that the invert elevation is adjustable using a t-handle wrench from the above walk-way. V-notch weirs shall be labeled with variations indicating outlet flow as shown on the drawings. Two overflow weirs, 18-inches minimum length each, shall be included in the flow distribution box such that the maximum flow entering the aeration basins does not exceed the maximum day design flow of listed in Part 1.06-System Description. Flow exceeding the maximum day flow will overflow into the equalization basins. Overflow weirs shall have manual height adjustment using a T-handle wrench with access from the above walk-way.
3. Discharge from the flow equalization pumps shall enter the flow distribution box as shown on the drawings for controlled, equal distribution to the aeration basins through the V-notch weirs.
4. The flow distribution box shall be designed by the package plant manufacturer and shall be deep enough to ensure that influent flow from the influent screening or flow equalization pumps is steady and able to be controlled over the effluent V-notch weirs for equal distribution to the Aeration Basins.

C. Pumps

1. Flow equalization pumps shall be submersible sewage pumps with a capacity of (insert values) gpm each. Pumps shall discharge into the flow distribution box as shown on the drawings.

2. Pumps shall operate in a “lead-lag” configuration with the following operating levels:
  - a. Lead pump on elevation: (insert elevation)
  - b. Lag pump on elevation: (insert elevation)
  - c. Lead pump off elevation: (insert elevation)
  - d. Lag pump off elevation: (insert elevation)

D. Aeration System Description

1. The process equipment manufacturer shall be responsible for providing a fully functional aeration system in the flow equalization basin. Manufacturer responsibilities will include design, sizing and coordinating the installation of pipe supports and all aeration equipment. All of the aeration system equipment specified is intended to be standard equipment to agitate and aerate raw influent to maintain a uniform mixture and keep any solids in suspension. Fixed headers and diffusers shall be positioned and configured as required to achieve this objective.
2. Minimum air required for mixing and shall not be less than 3.0 scfm/1000 gallons.
3. The headers shall be located so that the centerline of the diffusers is a minimum of 6-in above the bottom of the basins.
4. Standard conditions (scfm) is defined as 68 degrees F, 14.69 psia, and 36 percent relative humidity.
5. The entire system, including the droplegs, distribution headers and diffusers shall allow for expansion and contraction under the following conditions:
  - a. Winter conditions, partially full basins (20 degrees F)
  - b. Summer conditions, empty basins (100 degrees F)
  - c. Basins and Contents (80 degrees F)
  - d. Operation with Air Supply at 225 degrees F.

E. Air Distribution Piping

1. The air distribution system shall consist of an air header, air control valves, diffuser drop pipes, and diffuser assemblies. The system shall be capable of transferring 3.0 scfm per 1000 gallons. to sludge in the basin when compressed air is delivered to the piping outside the basins as shown on the Drawings. Alpha shall be as appropriate for the diffuser system provided, but in no case greater than 0.85. Beta shall be 0.95
2. The air header shall be designed to minimize head loss and provide an even distribution to all diffusers.



## F. Diffuser Assembly

1. Each diffuser drop pipe assembly within the tank shall include an air control valve accessible from the walkway for shut off of air supply, an above water orifice assembly, diffuser, and necessary pipe and fittings. The vertical portion of the drop pipe assembly shall be of Schedule 10 stainless steel construction. Provide steel brackets to support the diffuser drop pipes. Pipe materials for use in the diffuser shall be selected to prevent corrosion due to incompatible materials.

## 2.04 AERATION BASIN

### A. Aeration System

1. The aeration basins are used to reduce the biochemical oxygen demand (BOD) and to provide for full nitrification. The manufacturer shall submit detailed calculations that include the standard oxygen transfer efficiency (SOTE) and standard oxygen requirement (SOR) and air supply provided given the environmental conditions specified below in paragraph 2.04.A.3 and reactor configuration proposed by the manufacturer.
2. The process equipment manufacturer shall be responsible for providing a fully functional aeration system serving the aeration basin, equalization basin, sludge storage tank, and airlift pumps (WAS/RAS and scum line). The air system shall be designed and sized by the package plant manufacturer to supply the minimum air required for the biological process (including the process airlift pumping) to perform in accordance with the design criteria established in Section 1.06 of this specification. Manufacturer responsibilities will also include coordinating the installation of all aeration equipment.
3. The alpha correction factor shall be as appropriate for the diffuser system provided, but in no case greater than 0.65. Beta shall be 0.95. Minimum DO in the basin shall be 2.0 mg/L. Clean water oxygen transfer efficiencies shall be measured at Standard Conditions, at the specified average diffuser submergence, and by test procedures and conditions as specified. Standard Conditions are defined as 14.7 psia, 68 degrees F, and 36 percent relative humidity.

### B. Air Distribution Piping

1. The air distribution system shall consist of an air header, air control valves, pipe supports, diffuser drop pipes, and diffuser assemblies.
3. The main air header from the blowers shall be located as shown on the Drawings or as required by the manufacturer to provide the required process air based on the design criteria. The air header shall have connections provided for connection of air distribution piping to the diffusers.
4. The air header shall be designed to minimize head loss and provide an even distribution to all diffusers.
5. All air distribution piping shall be schedule 10 gauge stainless steel.
6. Each diffuser drop pipe assembly within the tank shall include an air control valve accessible from the walkway for shut off of air supply, an above water orifice assembly, diffuser, and necessary pipe and fittings. The vertical portion of the drop pipe assembly shall be of Schedule 10 stainless steel construction. Provide steel brackets to support the

diffuser drop pipes. Pipe materials used in the diffuser assembly shall be selected to prevent corrosion due to incompatible materials.

C. Diffuser Assembly

1. Air diffusers in the Aeration Basins shall be fine bubble. Diffusers shall operate within the manufacturer's design range at full capacity and at lower air flow ranges required to meet mixing limited conditions per ASCE/WEF.
2. Diffusers shall be arranged in such a manner that each diffuser shall be easily accessible for manual removal and replacement and for in-place cleaning of the diffusers. The rows shall also provide a clear walking space of a minimum of 18-in between the laterals. Maximum spacing between diffusers on lateral pipes and laterals shall be based on manufacturer's recommendations to meet the requirements of this Section and to prevent deposition of solids, but under no circumstances shall the spacing between diffusers exceed 4-ft center to center of diffusers or 2-feet from center of diffuser to any tank wall unless otherwise noted on the Drawings.

D. Air Lift Pumps

1. Two (2) air lift pumps shall be installed and used for RAS/WAS pumping with one (1) dedicated to each basin. Two (2) air lift pumps shall be used for scum removal with one (1) dedicated to each basin. The scum effluent line shall discharge into the flow equalization basin. One (1) air lift pump shall be used for decanting the sludge holding tank into the flow equalization basin. All air lift pumps shall be sized and designed by the manufacturer.
2. Each pump shall be furnished with Schedule 40 steel eductor pipe, discharge nozzle, and air injection pipe, all hot-dipped galvanized after fabrication. Each pump assembly shall be rigidly supported in place by supports to be sized and furnished by the equipment manufacturer.
3. Each air lift pump shall be provided with a full pipe size diameter manual air control valve with indicator and a piping union. The air injection pipe shall be external and not removable.

D. Effluent pipe to secondary clarifiers

1. Effluent pipe from the aeration basins to the secondary clarifiers shall be schedule 80 PVC.
2. Piping and valves shall be configured such that effluent from aeration basins 1 and 2 could be conveyed to either or both secondary clarifiers 1 and 2. Piping configuration shall allow the ability to isolate one aeration basin and/or one clarifier as maintenance or operational requirements dictate.

## 2.05 CLARIFIER

- A. All the clarification equipment shall be assembled in the manufacturer's shop to ensure proper fitting of parts, then match-marked for erection, and disassembled for shipment. Clarifiers shall have automatic mechanical collection mechanisms and shall not be the manual sludge collection type. Clarifiers shall have a maximum solids loading rate of 35 lb/day/ft<sup>2</sup> at peak hour flow.
- B. Sludge Collection Assembly
1. The sludge collection equipment shall be designed so that there will be no chains, sprockets, bearings, or operating mechanisms below the liquid surface or in contact with the liquid.
  2. All structural steel used in the fabrication of the sludge collection mechanisms shall conform to the requirements of ASTM A-36. All structural steel shall have a minimum thickness of ¼-inch, except as otherwise noted. All structural steel shall be hot-dipped galvanized after fabrication. Aluminum shall conform to the requirements of ASTM-6063-T5 and T6 as applicable. No field welding will be permitted.
  3. The maximum allowable stress on structural steel members when the full stall torque is applied shall not exceed 90% of those permitted by the latest AISC Specifications for the Design Fabrication, and Erection of Structural Steel for Buildings. All welding shall conform to the latest Standards of the American Welding Society.
- C. Drive Assembly
1. The center assembly shall be comprised of a drive unit with main bearing, suitable lubrication fittings, support points for the drive platform and adapter shaft to bolt to the lower shaft. The sludge collector drive assembly shall consist of an all helical gear drive assembly with a mechanical overload. No drives requiring lower supports for the torque tube will be allowed. No drives using chain drive turn table gears will be allowed. Belt driven sludge thickening mechanisms will not be acceptable.
  2. The entire drive assembly shall be designed on the basis of operating continuously, twenty-four hours a day for twenty years at an output torque of 4,000 ft-lbs at a maximum of 0.10 RPM. At this maximum continuous working output torque, all gearing in the drive train shall apply to both strength and durability with the minimum value used as the controlling limit. With respect to the main gear, the AGMA rating shall be based on a life of 20 years for both strength and durability. The drive assembly shall be capable of withstanding a stalled (momentary peak) torque of 8,000 ft-lbs. At the cut-out torque, no components of the drive train or drive platform shall be stressed to a level greater than 75 percent of the various materials' yield stress. In addition, the unit shall be of sufficient strength to screed the grout in the tank bottom without damage to any of its components.
  3. All gear drives shall be totally enclosed in a water-tight housing provided with graphitized asbestos or neoprene dust seals and designed so all gears and bearings run in oil. The housings shall be provided with oil level sight gauges, oil fill and drain connections and condensate drain connections from the low points of the oil reservoir.
  4. The primary gear shall be drive, or Engineer approved equal, by a direct mounted hollow shaft snuggler design and shall mount directly on the input shaft of the final gearbox. The primary gearmotor shall be held in place by the overload indicator box and shall incorporate accurate springs to linearly measure the rotation of the primary gearbox and thus the applied torque to the secondary unit. The over load box shall have a minimum of two (2) proximity

switches to accurately determine the set points desired. The first switch will signal when the alarm torque is reached, the second when the motor cut-out torque is reached. A stainless steel indicator plate will be mounted on top of the overload box and an indicator arrow will be easily visible to show the actual torque being applied at that moment.

5. Each drive motor shall have a minimum horsepower rating of 0.5 HP, 1725 RPM, 3/60/460 TEFC and shall be designed to NEMA B standards, totally enclosed with Class B insulation having a temperature rise of 80°C (measured resistance) above a 40°C ambient for outdoor service with a service factor of 1.15. The installed torque shall not exceed the nameplate rating. Space heaters shall be suitable for a Class I, Division II location. Each motor shall be provided with a gasketed watertight conduit box. Motors shall conform to the requirements of Section 01171.
  6. A torque test shall be conducted on the mechanism. The testing shall be carried out under the supervision and approval of the equipment manufacturer before the mechanisms are approved and placed into operation. The purpose of the test shall be to verify the structural integrity of the mechanism and drive. Manufacturer shall provide a technician for supervision during all tests.
  7. The torque test shall consist of securing the rake arms by cables to anchor bolts installed by the Contractor in the tank floor at locations recommended by the manufacturer and the Engineer. A torque load shall be applied to the scraper arms by means of a ratchet lever and cylinder connected to the cable assembly. The magnitude of the applied load shall be measured by calculating the torque from the distance of the line of action of each cable to the centerline of the mechanism. Readings shall be taken at 40%, 85% and 100% of design torque value. The test load shall be applied and noted on the torque overload device. The service technician shall certify the alarm and motor cut-out torque of the drives as calibrated in the manufacturer's shop and that they are in proper operation to shut-down and units as specified. Equipment required for the test shall be provided by the manufacturer. After the successful test, apparatus shall be returned to the equipment manufacturer.
- C. Two independently adjustable mechanical torque switches shall be set to provide motor cut-out and stop at 6,000 ft-lbs. The device shall also be set to an alarm (in the case of impending excessive load) at 3,400 ft-lbs. Provide auxiliary dry contacts where indicated in Division 13 and Division 16 as shown on the Drawings for remote sensing and control.
- D. Influent Feed Well
1. The center feedwell size shall be constructed of 3/16-inch plate and supported by horizontal beams anchored in the clarifier basin walls. The well shall be fabricated of steel plate, with top reinforcing rim angle and vertical angle stiffeners at supporting brackets.

E. Torque Tube

1. Each torque tube shall be of a minimum 6-inch diameter Schedule 40 steel pipe. The torque tube shall be fastened with a bolted connection to the adapter shaft to rotate the attached arms and cone scraper. The rake collector arms and surface skimmer arms shall be connected to the torque tube by bolted connections. The torque tube shall support and rotate the two rake collector arm assemblies. The design of the entire torque tube and rake collector arm assembly shall have sufficient strength and rigidity that no member will be stressed beyond the allowable limits set forth in the latest AISC Specification when the full stalled torque load of the drive assembly is applied.

F. Flight Arms

1. The sludge collector mechanism shall have two (2) structural steel rake collector arms rigidly connected to the torque tube. The rake collector arms shall be of a truss construction a minimum of 18 inches square conforming to the slope of the tank floor.
2. Each rake collector arm shall be provided with steel scraper blades designed to clean and remove settled sludge from the tank floor to a sludge sump located at the center of the tank.
3. The blade setting shall be identical for each rake collector arm with the blades spaced so that the entire circular portion of the tank bottom will be scraped at least twice with each revolution of the mechanism. The main rake collector blades shall have a minimum depth of 6 inches. All blades shall be provided with adjustable Type 304 stainless steel bolts and nuts. Each stainless steel squeegee shall have a minimum thickness of 20 gauge and be designed for a 1-inch minimum adjustment in the vertical plane.

G. Scum Trough

1. A hot dipped galvanized steel scum trough shall be furnished. The trough shall span the entire distance of the clarifier between the inlet well and the scum baffle.
  - a. The trough shall be formed of 1/4-inch for steel plate and be adequately braced and supported from the clarifier bridge while providing the removal of the grating sections to provide access for maintenance of the scum trough.
  - b. A piped connection shall be made to the clarified effluent to provide a constant supply of flushing water in order to motivate the scum in the trough into the scum pipe for transfer into the WAS Lift Station.
  - c. The knee braces shall be fabricated of minimum 4-inch by 4-inch by 1/4-inch steel angle vertical and horizontal members with a minimum 3-inch by 3-inch by 1/4-inch diagonal brace.
2. Scum collected from the troughs shall be discharged to the equalization basin.

H. Effluent Weirs and Baffles

1. The effluent weirs shall be fabricated as shown on the Drawings from polyester laminate or 10" deep x 12 Ga. Type 304 stainless steel with 2" deep 90 degree V-notches at 6" on centers, and shall be attached to the trough with minimum 3/8" diameter Type 316L stainless steel bolts and accessories at maximum 12" on center.
2. The scum baffles and angle supports shall be fabricated from minimum 10 Ga. Type 304L stainless steel. The baffles shall be 22" high and shall be supported at intervals not to exceed 4' on center. At each support or splice bracket the baffle shall be held in place by at least two (2) 1/2" diameter stainless steel carriage bolts and at least two (2) 1/2" diameter stainless steel anchors. Each support at 4' on center shall consist of a 304L stainless steel wall clip and either a type 304L stainless steel support clip or a splice clip, all being adjustable up, down, in and outward, for ease of installation. All materials to be type 304L stainless steel.

#### I. Effluent Drop Pipe

1. The effluent drop pipe and fittings conveying water from the concrete clarifier effluent trough into the cloth disk filter unit shall be PVC.

### 2.06 AERATED SLUDGE HOLDING TANK

#### A. Aeration System Description

1. The process equipment manufacturer shall be responsible for providing a fully functional aeration system in the sludge holding tank located at the south end of the WWTP. Manufacturer responsibilities will include design, sizing and coordinating the installation of pipe supports and all aeration equipment. All of the aeration system equipment specified is intended to be standard equipment to agitate and aerate waste activated sludge and thickened waste activated sludge to maintain a uniform mixture and keep solids in suspension. Fixed headers shall be positioned and configured as required to achieve this objective.
2. Minimum air required for mixing and shall not be less than 3.0 scfm/1000 gallons.
3. The headers shall be located so that the centerline of the diffusers is a minimum of 6-in above the bottom of the basins.
4. Standard conditions (scfm) is defined as 68 degrees F, 14.69 psia, and 36 percent relative humidity.
5. The entire system, including the droplegs, distribution headers and diffusers shall allow for expansion and contraction under the following conditions:
  - e. Winter conditions, partially full basins (20 degrees F)
  - f. Summer conditions, empty basins (100 degrees F)
  - g. Basins and Contents (80 degrees F)
  - h. Operation with Air Supply at 225 degrees F.

#### B. Air Distribution Piping

1. The air distribution system shall consist of an air header, air control valves, diffuser drop pipes, and diffuser assemblies. The system shall be capable of transferring 3.0 scfm per

1000 gallons. to sludge in the basin when compressed air is delivered to the piping outside the basins as shown on the Drawings. Alpha shall be as appropriate for the diffuser system provided, but in no case greater than 0.85. Beta shall be 0.95

2. The air header shall be designed to minimize head loss and provide an even distribution to all diffusers.

C. Diffuser Assembly

1. Diffused aeration shall be coarse bubble.
2. Each diffuser drop pipe assembly within the tank shall include an air control valve accessible from the walkway for shut off of air supply, an above water orifice assembly, diffuser, and necessary pipe and fittings. The vertical portion of the drop pipe assembly shall be of Schedule 10 stainless steel construction. Provide steel brackets to support the diffuser drop pipes. Pipe materials for use in the diffuser shall be selected to prevent corrosion due to incompatible materials.

D. Decant Pump and Mechanism

1. A decant pump shall be installed in the sludge holding tank that is configured to discharge supernatant to the equalization tank after the sludge has settled.
2. The decant pump suction elevation shall be variably controlled by the operator and able to withdraw supernatant down to 5 feet above the tank bottom.

E. Sludge Draw-Off

1. A 4" sludge draw-off line shall be supplied by the package plant manufacturer and shall be 4" flanged painted ductile iron pipe. The draw-off shall be installed as shown on the drawings with the suction located 6-inches above the sludge holding tank bottom. A 1-1/2 inch port shall be tapped into the high point of the suction line at the top of the wall and shall discharge into the Aerated Sludge Holding Tank as shown on the drawings.

2.07 POSITIVE DISPLACEMENT BLOWERS

A. Blower System Description

3. All of the equipment specified herein is intended to be standard equipment for use in low pressure air systems.
4. The air systems shall use rotary positive displacement air blowers and shall be as follows:
  - a. Blowers shall be designed and sized based on the minimum process air requirements of the processes and equipment listed below. Six blowers with constant speed drives shall be provided for the entire aeration system. Blowers shall be located on the blower pad east of the aeration basins as indicated on the drawings.
    1. Aeration Basins
    2. Flow Equalization Basin(s)

3. Aerated Sludge Storage Tank

4. All air lift pumps as required by the process configuration including but not limited to: RAS/WAS pumps, scum discharge pumps, sludge holding tank decant

b. Blower redundancy shall be provided such that the process air requirements for both aeration and mixing can be supplied with the largest unit out of service. Three blowers shall be dedicated to the Aeration basins (fine bubble diffusers) including the associated air-lift pumping and three blowers shall be dedicated to the equalization and aerated sludge holding tank basins. Discharge piping and valves shall be configured to allow any single unit to be taken off-line as shown on the drawings.

C. The blowers shall be as follows (based on design temperature of 105 degrees Fahrenheit, relative humidity of 85 percent and 500 feet above sea level:

1. Design Criteria

		Aeration Basins	Flow Equalization Basin	Aerated Sludge Holding Tank	Air Lift Pumps
a.	Quantity	3 (1 dedicated to each train with 1 spare)	3		N/A
b.	Minimum Air Supply (ICFM)	(insert value)	(insert value)		(insert value)
c.	Discharge Pressure (psig)	Varies on diffuser (manufacturer to determine)			
d.	Ambient Pressure (psia)	14.69			
e.	Blower Inlet Flange Pressure (psia)	14.69			
f.	Total Δ P (psi)	Varies			
g.	Maximum Motor Hp	(insert value) (ea)	(insert value) (ea)		N/A

Manufacturer to size and determine the following to meet the design criteria given in this specification: Motor horsepower, design speed (rpm), minimum blower turndown.

D. Blowers shall be constant speed.

B. Maintenance

1. Tools and Spare Parts

a. Special tools and spare parts shall be furnished with the equipment in accordance with Section 01170.

b. As a minimum, the following spare parts shall be furnished with the equipment. Spare parts shall be properly bound and labeled for easy identification without opening the packaging and suitably protected for long term storage in a humid environment.

1. Two complete sets of gaskets, seals, O-rings if applicable, etc, for each blower



2. Two additional sets of filtering media for each air inlet filter for the blowers.
3. Lubricants for one year of operation.
4. One set of belts for each blower.
5. One set of tools required for changing oil and performing belt maintenance shall be provided for each size blower.

#### C. Warranty

1. The blower manufacturer shall provide a five year warranty on all blower package components, excluding the motor (motor warranty per Article 21, Instructions to Bidders). Warranty shall include a guarantee to initiate problem remediation within 24 hours of notification. The blower manufacturer shall provide a factory trained technician for two scheduled trips per year who shall perform all maintenance tasks per the manufacturer's operating manual. As a minimum, these tasks shall include changing oils and checking maintenance items including: shaft seals, belts, coupling inserts, oil filter, air filter, gaskets, and twice per year oil analyses for each unit. Blower manufacturer is responsible for keeping these parts in working condition over the warranty period. All maintenance items and materials indicated herein shall be provided by the blower manufacturer at no additional cost to the Owner over the five year warranty period.

#### D. Materials and Equipment

1. This Section is intended to give a general description of what is required, but does not cover all details which may vary in accordance with the exact requirements of the equipment as offered. It is, however, intended to cover the furnishing, delivery, installation and field-testing of all materials, equipment and apparatus as required. Any additional auxiliary equipment necessary for the proper operation of the proposed installation not mentioned in this Section or shown on the Drawings shall be furnished and installed. General configuration of the blower package, including piping orientation is shown on the Drawings. Any modifications to accommodate a different blower arrangement, associated piping and appurtenances shall be the Contractor's responsibility to coordinate and redesign and shall be done at no additional cost to the Owner.
2. All equipment shall be designed and proportioned to have liberal strength, stability and stiffness and shall be especially adapted for the intended service. Ample room and facilities shall be provided for inspection, repairs and adjustments. Sound enclosures shall not interfere with this requirement and shall not require disassembly of the piping or use of tools to meet the aforementioned requirements. Operator shall not be required to reach over any component of the blower package to perform oil filling or draining.
3. Blower bases. No special foundations shall be required. Blowers and ancillary equipment shall be installed on a concrete slab without grouting. Vibration isolating feet and flexible pipe connectors with a minimum efficiency of 80 percent shall be used. Blower Manufacturer shall supply anchor bolt sizing and templates for bolt installation.
4. Blowers shall each be furnished as part of an equipment package which includes outside pipe inlet covers, the inlet filter, inlet and outlet silencers, base frame, motor, check valve, pressure relief valves, start unloading valves, instrumentation, inlet and discharge flex

connectors, sound-proof enclosures, steel skid/oil drip pan, and other accessory equipment named in Section 2.07.

5. Brass or stainless steel nameplates, giving the manufacturer, the serial number of the item, the rated capacity, speed and other pertinent data shall be properly and rigidly attached to each item of equipment.
6. The blowers shall be housed in sound-proof enclosures such that the sound pressure level generated from the motors, silencers and accessories as installed with one unit running does not exceed 85 dBA at a distance of 3-ft from the outline of the blower package when tested in accordance with ISO 2151. The equipment shall be tested in an arrangement similar to the equipment to be furnished herein. The test shall include the noise from the motor. Test results shall be submitted to the Engineer. Performance tests after installation shall be performed to confirm installed sound pressure level is below maximum allowable. It is the blower manufacturer's responsibility under this Section, at no additional cost to the Owner, to provide whatever measures required to meet the specified noise criteria, including but not limited to all air distribution piping and pipe lagging, if required. Lagging, if provided, shall be 4-inch thick acoustic material with a density of 7.5-8.0 lb/ cu ft wrapped in an acoustic sheet covered by a galvanized steel shell. Acoustic treatment must be installed by qualified personnel trained to avoid transmission of structure-borne noise from the pipe and silencers to the insulation shell. All measures so provided must be approved by the Engineer.

#### E. Blowers and Drives

1. The air blowers shall be rotary positive displacement type blowers and shall deliver oil-free air at the quantities and pressures as specified in Paragraph 2.06.C above. Sliding vane type blowers are not acceptable.
2. Timing gears and all bearings shall be oil splash lubricated. Bearings and gears shall not be grease lubricated. Recessed oil sight glasses shall be directly attached on each oil sump to observe the oil level in the reservoirs. A double sealing arrangement shall be provided to prevent lubricant from contaminating the air stream. The sealing arrangement may not utilize any type of lip seal. Seals shall be designed to prevent lubricant from leaking into the air stream and from leaking from the machine. Four rotary piston ring shaft seals, an oil slinger, and an o-ring seal shall be provided at the point where the shaft passes through the side plate. Further provision shall be made to vent the impeller side of the oil seal to atmosphere to eliminate any possible carry-over of lubricant into the air stream. Oil drain valves shall be directly mounted on the oil sump covers. The blower stage shall be removable from its base without having to drain the oil. An oil fill and drain kit shall be provided.
3. The blowers shall be constructed with inlet and discharge connections oriented as shown on the Drawings. The blower casing shall be a single piece of close-grained cast iron, ASTM A48, with flanged connections and suitably ribbed to prevent distortion. Separate side plate, of the same material, shall be bolted and pinned to the housing. The blower housing shall incorporate a proven means of pulsation cancellation such that the noise level measured at the outline of the blower package does not exceed 85 dBA. Blowers that do not incorporate pulsation cancellation shall provide design and sizing calculations of blower package components demonstrating compliance with this requirement over the entire operating range of the blower. The vibration level measured at the blower casing, in the X/Y planes of the bearings, shall not exceed ½ inch per second RMS when operating at

the specified maximum operating pressure and speed. Each impeller shall be of the “stiff” design with lateral critical speed at least 120% of the maximum allowable operating speed. The impeller shall operate without rubbing or liquid seals or lubrication. The impellers shall be statically and dynamically balanced per ISO 1940.ANSI S2.19CG.3. Each impeller shaft shall be supported by cylindrical roller bearings and fixed to control the axial location of the impeller/shaft in the unit. Balancing shall be done internally and shall not be accomplished by drilling to remove material or by adding material to the outside of the rotor. The rotor shall be press fit and keyed onto a solid single piece shaft made from carbon steel AISI 1043. All other blower rotor/shafts shall be drop forged in one single piece of AISI 1043. Rotors shall be timed by a pair of accurately machined, single helical, steel timing gears with hardened and ground teeth manufactured to AGMA 12 standards, 1.7 minimum service factor per AGMA at maximum operating point. The rotor shafts (A293 CL I) shall be supported by liberally proportioned anti-friction bearings. The B-10 life expectancy of each bearing as defined by the ABMA shall be not less than 250,000 hours. Calculations for bearing life with assumed factors and constants shall be provided. The blowers shall be provided with inlet and discharge connections of the same size as the inlet and discharge silencers. The blowers shall have casings with a hydrostatic test pressure of 1.5 maximum continuous design pressure rating at operating temperatures.

4. Each blower shall be driven by a horizontal, totally enclosed, fan cooled, NEMA Design B motor, inverter duty type with insulated shaft and bearings. The inverter duty requirement shall apply to all blowers, whether specified to include a VFD or not. All blower motors shall be designed for operation on a 460 volt, 3 phase, 60 Hz alternating current system. Motor horsepower shall be as designed by the manufacturer to meet the design criterion specified in this section but shall not exceed the maximum horsepower specified in Paragraph 2.06.A above. Provide a method to mitigate shaft and bearing currents.
6. The motor shall be mounted on a pivoting base to provide automatic tensioning of the belts. Each blower shall be supplied with a V-belt drive of the high capacity type, oil and heat resistant. Belt tensioning shall be automatic without the use of any devices or operator interaction. Side rails or adjustable spring bed shall not be used. Sheaves shall be dynamically balanced for linear tip speeds greater than 6500 ft/min. The belt drive shall be covered by a perforated galvanized steel guard in compliance with OSHA regulations. The belt guard shall be removable for belt inspection and replacement. Blower manufacturer shall be responsible for coordinating the starting torque requirements of the blower and motor. The motors shall be in accordance with the latest NEMA, IEEE, ANSI and ABMA standards where applicable. Motor rpm and rotation shall be coordinated with the rotary positive displacement type blowers specified herein.
7. Each blower and drive motor shall be factory mounted on a common base of cast iron or steel fabrication, suitably constructed to support the weight of the equipment. Blowers and motors shall be mounted inside sound proof enclosures.

#### F. Blower Accessory Equipment

1. Each blower shall be provided with the following accessory equipment: outside inlet pipe cover to protect from weather intrusion and noise emission, one inlet filter, one inlet silencer, one discharge silencer, one pair of flexible connectors, one check valve, one pressure relief valve, one automatic unloading valve sized by the blower manufacturer, one discharge high-pressure switch, one differential pressure switch to measure pressure drop across the inlet filter, two pressure gages to indicate inlet and discharge pressure, one discharge air thermometer, and a high temperature switch, as shown on the Drawings.

2. Each blower shall be supplied with one combination inlet filter-silencer. Separate inlet filters and silencers shall be accepted if they are standard design for the equipment furnished. The filter media shall have an efficiency of 90% by weight per ASHRE 52-76 with synthetic dust equivalent to separation > 95% @ 5 microns. The inlet filter silencer shall be suitable for indoor installation and mounted directly to the inlet flange of the blower. Filter element shall be washable by maintenance personnel. Filter and silencer performance losses shall be included by the blower vendor in the blower performance calculation.
3. Inlet and discharge silencers shall be of a proven design, compatible with and designed for operation with positive displacement blowers as specified herein. Silencers shall be designed for and acceptable for continuous operation at any speed within the speed ranges as specified herein. Discharge silencers shall be of the chamber type with no absorption material. Absorption material may be used with the inlet silencer if the absorption material is located upstream of the blower inlet filter. The silencers shall be of heavy duty, all welded steel construction with a working pressure of at least 15 psig. Silencers shall be designed for fatigue resistance. Materials for shell and supporting internal parts shall be pressure vessel quality steel such as ASTM A283 Grade B or ASTM A285 Grade C or equivalent. The silencer shell and nozzles shall be designed and welded in accordance with ASME pressure vessel code. Fibers shall not be used as packing material. Inlets and outlets shall be flanged connections drilled to 125/150 lb ANSI specifications. Silencers shall be designed to reduce the noise emitted by the piping to and from the blower package to 85 dBA over the entire range of operation. The pressure drop across each silencer under maximum flow conditions shall not exceed 8-inches water column. Inlet silencers that are a combination of a pulsation type dampener with a true split-flow absorption silencer are acceptable provided that the manufacturer provides operating experience from similar installations that is acceptable to the Engineer. A five year extended, unconditional warranty shall be furnished for all silencers. Repair welding is not acceptable.
4. Provide bellows or arch type flexible connectors with internal sleeves to connect the inlet and outlet of each blower to the silencers, placed as recommended by the manufacturer to ensure blower isolation from the connecting piping. Connectors shall have standard flanged connections and shall be designed to withstand the maximum temperature, pressure and vibration that may result from the operation of the system. Connector size shall be the same as the inlet and discharge silencer connections.
5. Check valves shall be full-bore for low-pressure drop and have cast iron bodies, stainless steel pin and spring and two semicircular aluminum bronze plates. The plates shall be spring loaded and have Buna-N, O-ring type seals along the seating surface. The check valve shall be of the wafer type, designed to fit between two 150-lb steel flanges. The check valve shall be as manufactured by Mission Valve and Pump Co., Houston TX, Apco Valve and Primer Co., or equal.
6. Pressure relief valves shall be of the spring-loaded type. Size shall be as recommended by the blower manufacturer. Each blower shall be supplied with a single relief valve that has the capacity of relieving the entire discharge flow of the blower. Set pressure shall be 1 lb greater than the maximum discharge pressure rating. The relief valve shall be housed within the sound enclosure and shall relieve into a segmented section of the enclosure. The design of the valve shall permit the discharge of the relief valve to be piped away.
7. Discharge butterfly valves shall be as specified in Section (15100).

8. Gages shall be provided to indicate the pressure in the inlet and discharge line of each blower. The gages shall be liquid filled and designed for base plate panel mounting. Scale shall be of the duplex type with one side graduated in psig. The body shall be of aluminum construction with 1/4-in NPT pressure connections. The unit shall have stainless bourdon tube and socket material. Gages shall be furnished complete with all tubing, fittings, adapters, shutoff valves and common gage panel required for a complete installation.
9. A discharge air thermometer for each blower shall be provided with a 5-in dial scale, graduated in 5 degrees F intervals, and an accuracy of plus or minus 5 degrees F. The thermometer shall read 50 to 300 degrees F. The thermometer shall be furnished complete with all tubing, fittings, adapters, and shut off valves required for a complete installation.
10. A high temperature switch suitable for discharge air temperatures up to 300 degrees F shall be provided and installed on each discharge header. The DPDT switch shall be automatic trip on temperature rise, manual reset after temperature fall. The temperature switch shall have an easily adjustable trip setting and adjustable deadband, initial setting shall be as recommended by the equipment manufacturer. Contacts shall be snap-action type arranged for two sets of normally open and two set normally closed (DPDT), and rated for 10 amperes at 120 volts AC. The switch shall be enclosed in a NEMA 4 water tight/dust tight enclosure of heavy gauge steel with metallic acrylic enamel finish and glass front, as manufactured by Mercoind Control or equal. The switch shall be furnished complete with all tubing, fittings, adapters, and shut off valves required for a complete installation.
11. Provide a differential pressure switch across the inlet filter/silencer to measure pressure drop. The DPDT switch shall be automatic trip on differential pressure rise, manual reset after differential pressure fall. The differential pressure switch shall have an easily adjustable trip setting and adjustable deadband, initial setting shall be as recommended by the equipment manufacturer. Contacts shall be snap-action type arranged for two sets of normally open and two set normally closed (DPDT), and rated for 10 amperes at 120 volts AC. The switch shall be enclosed in a NEMA 4 water tight/dust tight enclosure of heavy gauge steel with metallic acrylic enamel finish and glass front, as manufactured by Ashcroft or equal. The switch shall be furnished complete with all tubing, fittings, adapters, and shut off valves required for a complete installation.
12. Provide a discharge pressure switch of the general-purpose type, adjustable within a range of 0 to 15 psig, with manual reset. The pressure switch shall be automatic trip on pressure rise, manual reset after pressure fall. The pressure switch shall have an easily adjustable trip setting and adjustable deadband, initial setting shall be as recommended by the equipment manufacturer. Contacts shall be snap-action type arranged for two sets of normally open and two set normally closed (DPDT), and rated for 10 amperes at 120 volts AC. The switch shall be enclosed in a NEMA 4 water tight/dust tight enclosure of heavy gauge steel with metallic acrylic enamel finish and glass front, as manufactured by Ascroft or equal. The switch shall be furnished complete with all tubing, fittings, adapters, and shut off valves as required for a complete installation.
13. For the first stage aeration blowers only, a vibration monitoring system shall be furnished for the blowers. The system shall consist of a vibration sensing transmitter control panel mounted near each blower. The mounting location of the sensing transducers shall be determined by the blower manufacturer. Vibrations will initiate an alarm, programmed in the local vibration transmitter control panel, warning at 1.0 in./sec and shutdown at 1.2

in./sec. Actual set points for alarm shall be as recommended by the blower manufacturer. Wiring between the transducers and the transmitter shall be by the vendor. Provide two sets of normally open and two set of normally closed (DPDT) contacts rated for 10 amperes at 120 volts AC for remote monitoring.

- O. Each blower shall be supplied with a sound enclosure covering the entire blower package including the drive motor. The sound enclosure must be designed for easy inspection and maintenance of all blower package components. Panels shall be made of galvanized steel sheet, internally and externally powder coated in a light reflecting, cream or tan color. The skid shall be the same color. Sound enclosure acoustic material, as a minimum, shall comply with UL 94 - HF1 for fire-retardant, self-extinguishing, non-dripping materials. Materials with a lesser rating are not acceptable. If used, non-flammable packing materials such as compressed mineral fibers are only acceptable if lined with appropriate retaining mat and supported by galvanized perforated sheet. The enclosure shall provide suitable protection for outdoor installation under site conditions (wind load and snow load) applicable to the specified site. The enclosure and the blower package must be both mounted on a skid /oil-drip pan designed for meeting environment protection standards and for easy transportation and installation. A grounding strap shall be installed between the blower base and the package skid to bypass any vibration isolating mounts. Quick release panels, each less than 50 lb (as mandated by MSHA) must provide easy and quick access for routine maintenance of the blower and the package components. Should the panels be heavier than 50 lbs, hinged doors must be supplied, with the appropriate frame, reinforcements and supporting elements. A high efficiency blower shaft driven ventilation fan shall provide ventilation and cooling integral to the sound enclosure. Motor driven ventilation fans shall be permitted as long as the blower manufacturer provides a factory installed and prewired system which includes the fan motor, motor starter, wiring and NEMA 4X stainless steel, fan control panel. Fan shall operate on sufficient HP motors of 230/460-3-60 power. Fan control panel shall only allow the main blower motor to run after ventilation fan operation is confirmed. Contractor shall only make electrical connections for the ventilations system in the provided control panel. Cooling fan shall be sized for sufficient heat removal from the sound enclosure. Electrical components, instrumentation and instrument connections shall not be mounted or interface with moving panels of the sound enclosure.

## 2.08 PLATFORM, WALKWAY AND STAIRWAY

- A. The drive platform and walkway assembly shall be supported by tank sidewall. The access bridge shall consist of galvanized steel structural beams sufficient to support the walkway and operating platform and shall extend from one outer wall across both walls of the thickener as shown on the Drawings. Deflection of access bridge under maximum load (dead load and a live load of 100 psf) shall not exceed 1/360 of span. The drive platform shall be skidproof 3/8-inch thick aluminum checkered plate with an area of at least 6'-0" by 6'-0" to provide access around the drive. The walkway shall be 1 1/2 -inch minimum fiberglass reinforced plastic (FRP) at least 36-inches wide inside the handrails. Walkway shall be designed for a superimposed loading of 100 lbs. per square foot. Aluminum handrailing shall be 1 1/2-inch ID Schedule 40 for rails and Schedule 80 for line posts, 42 inches high, with an intermediate rail located 24 inches above the floor plate, 6063-T6 satin brushed and anodized aluminum pipe capable of withstanding 300 pounds loading on the top rail and with a 4-inch high toeboard attached to both sides of the bridge and extend around the operating platform. The handrailing shall conform to the standard details shown on the Drawings and to Division 5 with respect to materials and type of construction, line and post dimensions, and spacing and strength requirements. The walkways surface shall be at the same elevation as the

adjacent walkways at the access end of the bridge to provide a uniform walkway surface as shown on the Drawings.

- B. A stairway consisting of galvanized steel structural beams and 1 ½-inch galvanized steel grating as steps shall be provided from the walkway to the concrete landing as shown on the drawings. The stairway shall be 36-inches wide inside the handrails. The aluminum handrails shall be 1 ½-inches I.D. Schedule 40 and the posts shall be Schedule 80. Construction of the stairway shall conform with standard details shown on the Drawings. The stairway shall be designed to carry the deadload, plus a live load of 100 psf without deflecting more than 1/360 of the span. The stairway must be sufficiently rigid to not vibrate and “bounce” when in use. All OSHA requirements for stairway height and landing requirements must be observed.

## 2.09 BOLTS, NUTS, WASHERS AND ANCHORS

- A. It shall be the responsibility of the equipment manufacturer to determine the number, size, and location of all anchor bolts to be set in concrete. Anchor bolts, nuts, and washers shall be galvanized steel. All anchor bolts shall be furnished by the equipment manufacturer.
- B. Bolts for the equipment assembly shall be of the best quality refined bar iron. Hexagonal nuts of the same quality of metal as the bolts shall be used. All threads shall be clean cut and shall conform to ANSI B1.1960 for Unified Screw Threads. Bolts, nuts, and washers shall be galvanized by the hot-dip process in conformity with the ASTM Standard Specifications for Zinc (Hot-Galvanized) coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars and Strip, Designation A123-68 or shall be zinc-coated, after being threaded, the Standard Specifications for Zinc Coating (Hot Dip) on Iron and Steel Hardware, Designation A153-67, as is appropriate.

## PART 3: EXECUTION

### 3.01 INSTALLATION

- A. Installation shall be in strict accordance with the manufacturer’s recommendations. Installation shall include furnishing the required oil and grease for operation.
- B. Wall plates shall be shop rolled to the proper radius and installed by methods to maintain curvature of the tank. Any field welding shall have weld spatter and burrs removed by chipping and grinding to prevent operator injury and an irregular coating system. Installation shall include the total assembly, including but not limited to handrails, diffusers and drop pipes, scraper assembly and weir gate assembly. Installation/erection shall also include leveling and adjusting the weir plates and scraper assembly.
- C. All blower piping shall be supported so as to preclude the possibility of exerting undue forces and moments on the blower flanges. Suitable expansion joints shall be furnished to isolate the blowers from the piping system. Each blower unit shall be mounted flat and level on the concrete slab in a manner suitable for supporting the dead weight of the unit.
- D. Field painting of the plant and any accessories mounted on or attached to the exterior of the tank shall include masking of all surfaces not required to be painted.

### 3.02 WELDING

- A. Quality of Welds
1. All weld metal shall be sound throughout and there shall be no cracks in any weld or weld pass.
  2. All welds shall be free from overlap with no undercutting allowed.
  3. All craters shall be filled to the full cross-section of the welds.
  4. The construction crew shall remove weld scale or slag, spatter, burrs, and other sharp or rough projections in a manner that will leave the surface suitable for any required non-destructive testing and the subsequent cleaning and painting operation.
- B. When welding is unsatisfactory or indicates inferior workmanship, the following corrective measures will be required by the Engineer. Where requirements prescribe the removal of part of the weld or a portion of the base metal, such removal shall be by chipping or grinding. Any gouging may be performed only with the specific approval of the Contractor's welding inspector. Where corrections require the deposition of additional weld metal, the sides of the area to be welded shall have not less than 1:1 slope to allow sufficient room for depositing new metal.
- C. Defective or unsound welds shall be corrected either by removing and replacing the entire weld, or as follows:
1. Excessive convexity. Reduce to size by removal of excess weld metal by grinding.
  2. Shrinkage cracks, cracks in base metal, craters, and excessive porosity. Remove defective portions of base and weld metal down to sound metal, and deposit additional sound weld metal.
  3. Undercutting, undersize, and excessive concavity. Clean and deposit additional weld metal.
  4. Overlapping and incomplete fusion. Remove and replace the defective portion of weld.
  5. Slag inclusions. Remove those parts of the weld containing slag and fill with sound weld metal.
  6. Removal of adjacent base metal during welding. Clean and form full size by depositing additional weld metal.
- D. Where corrections require the deposition of additional weld metal, the electrode used shall be smaller than the electrode used for making the weld. Surface shall be cleaned thoroughly before rewelding.
- E. A cracked weld shall be removed through its length, unless the extent of the crack can be ascertained to be limited, in which case the weld shall be removed 2 inches beyond each end of the crack and repairs made.
- F. Where work performed subsequent to the making of a deficient weld has rendered the weld inaccessible or has caused new conditions which would make the correction of the deficiency dangerous or ineffectual, the original conditions shall be restored by removal of welds or members or both before making the necessary corrections.



- G. Improperly fitted and misaligned parts shall be cut apart and rewelded. Members distorted by the heat of welding shall be straightened by mechanical means or by the carefully supervised application of a limited amount of localized heat. Heated areas shall not exceed 1200°F as measured by Tempilsticks. Parts to be heated for straightening shall be substantially free of stress from external forces, except when mechanical means are used in conjunction with the application of heat.

### 3.03 FIELD TESTING

- A. After all the equipment and structures have been completely installed, and the installation approved by the manufacturer's representative in writing and the Engineer, a hydraulic leakage test and an initial start-up test of the system shall be conducted as directed by the manufacturer's representative to demonstrate the proper functioning of the system and all component parts thereof. The hydraulic leakage test shall be per Section 01671. A 24-hour operating period will be required before acceptance.
- B. Upon completion of the above test, a written report shall be furnished by the manufacturer and shall describe the representative's observations. This report shall describe any deficiencies noted.
- C. The Engineer may require any deficiencies noted to be corrected, by repairing or replacing the defective component and retesting the component and/or system until it meets the approval of the Engineer, at no additional cost to the Owner.

### 3.04 FIELD PAINTING

#### A. General

1. All surface preparation, coating and painting shall conform to applicable standards of the Steel Structures Painting Council, and the manufacturer's printed instructions. Material applied prior to approval of the surface by the Engineer shall be removed and reapplied to the satisfaction of the Engineer at the expense of the Contractor.
2. All work shall be performed by skilled craftsmen qualified to perform the required work in a manner comparable with the best standards of practice. Continuity of personnel shall be maintained and Owner shall be informed, in writing, of transfers of key personnel.
3. The Contractor shall provide a supervisor at the work site during all cleaning and application operation. The supervisor shall have the authority to sign change orders, coordinate work and make decisions pertaining to the fulfillment of the contract.
4. Dust, dirt, oil, grease or any foreign matter that will affect the adhesion or durability of the finish must be removed by washing with clean rags dipped in an approved cleaning solvent and wiped with dry clean rags.
5. Coating and painting systems include surface preparations, prime coating and finish coatings. Unless otherwise specified, prime coating shall be field applied. Any off-site work which does not conform to this specification is subject to rejection by the Engineer.

Prime coatings which are damaged shall be thoroughly cleaned and touched up as directed by the Engineer. The Contractor shall use repair procedures which ensure the complete protection of all adjacent primer. The specified repair method and equipment may include wirebrushing, hand or power tool cleaning or dry air blast cleaning. All cleaning shall be to

SSPC-SP10 standards. In order to prevent injury to surrounding painted areas, blast cleaning may require use of lower air pressure, small nozzle and abrasive particle sizes, short blast nozzle distance from surface shielding and masking. If damage is too extensive or uneconomical to touchup then the item shall be recleaned and coated or painted as directed by the Engineer.

6. The Contractor's coating and painting equipment shall be designed for application of materials specified and shall be maintained in first class working condition. Compressors shall have suitable traps and filters to remove water and oils from the air. Contractor's equipment shall be subject to approval of the Engineer.
7. Application of the first coat shall follow immediately after surface preparation and cleaning and within an eight-hour working day. Any cleaned areas not receiving first coat within an eight-hour period shall be recleaned prior to application of first coat.
8. Prior to assembly, all surfaces made inaccessible after assembly shall be prepared as specified herein and shall receive the coating or paint system specified.

#### B. Surface Preparation

1. The latest revision of the following surface preparation specifications of the Steel Structures Painting Council shall form a part of this specification:
  - a. Interior Surface Preparation shall be SSPC-SP10 Near White Metal Blast Cleaning as noted in Structural Steel Painting Council's most recent guidelines, November 1, 1982 volumes.
  - b. Exterior Surface Preparation shall be SSPC-SP10 Near White Metal Cleaning as noted in Structural Steel Painting Council's most recent guidelines, November 1, 1982 volumes.
2. Slag and weld metal accumulation and spatters not removed by the Fabricator, Erector or Installer shall be removed by chipping and grinding. All sharp edges shall be ground or otherwise blunted to a radius or 1/8-inch minimum, 1/4-inch preferred.
3. Field blast cleaning for all surfaces shall be dry method unless otherwise directed.
4. All internal surfaces subject to immersion service shall be sandblasted to near white metal per SSPC-SP10, and shall have a profile of 2.0 to 2.5 mils. All external surfaces subject to immersion service shall be sandblasted to near white metal per SSPC-SP10, and shall have a profile of 2.0 to 2.5 mils.
5. Blast only as much steel as can be coated the same day of blasting. Blast material to be used shall be 16-35 mesh, sharp angular grained silica sand that is fresh water washed, dried, graded and delivered to the jobsite in moisture-proof bags, and, with 90 psi (minimum) at the blast nozzle, will produce a 2.0 to 2.5 mil profile. The profile thus obtained may be verified with replica tape such as the Tes-Text Tape, and the tapes then given to the Owner for filing for future reference. Blasting shall not be performed if the surface may become wet before priming commences, or when surfaces are less than 5°F above the dew point.
6. During blast cleaning operations, caution shall be exercised to ensure that existing coatings or paint are not exposed to abrasion from blast cleaning.

7. The contractor shall keep the area of his work in a clean condition and shall not permit blasting materials to accumulate as to constitute a nuisance or hazard to the prosecution of the work or the operation of the existing facilities.
8. Blast cleaned surfaces shall be cleaned prior to application of specified coatings or paint. No coatings or paint shall be applied over damp or moist surfaces.
9. All welds shall be neutralized with a suitable chemical compatible with the specified coating materials.
10. Surface preparation shall be by sandblasting as long as the Contractor's operations do not create a nuisance. If, in the opinion of the Engineer, or other regulatory agencies, the Contractor's operation is creating a nuisance, the Contractor will be required to shroud the work area, or change surface preparation techniques. Any required shrouding or change in preparation technique required as a result of a nuisance will be provided at no cost to the Owner.

#### C. Application

1. Coating and paint application shall conform to the requirements of the Steel Structures Painting Council Paint Application Specification SSPC-PA1 (latest revision), the American Water Works Association (except as noted), and the manufacturer of the coating and paint materials.
2. Thinning shall be permitted only as recommended by the manufacturer and approved, in writing, by the Engineer. Thinning materials shall be of the same manufacture as the coating material.
3. Each application of coating or paint shall be applied evenly, free of brush marks, sags, runs, with no evidence of poor workmanship. Care shall be exercised to avoid lapping on glass or hardware. Coatings and paints shall be sharply cut to lines. Finished surfaces shall be free from defects or blemishes.
4. Protective coverings or drop cloths shall be used to protect floors, fixtures, and equipment. Care shall be exercised to prevent coatings or paints from being spattered onto surfaces which are not to be coated or painted. Surfaces from which materials cannot be removed satisfactorily shall be recoated or repainted as required to produce a finish satisfactory to the Engineer.
5. When two coats of coating or paint are specified, where possible, the first coat shall contain sufficient approved color additive to act as an indicator of coverage or the two coats must be of contrasting color.
6. All material shall be applied as specified.
7. All welds and irregular surfaces shall receive a brush coat, with a stiff brush, of the specified product thinned, per the manufacturer's written recommendations, prior to application of the first complete coat.

#### D. Paint System

1. Galvanized steel and aluminum surfaces shall not be painted except that aluminum shall be coated with one coat of zinc chromate in contact with steel or concrete to prevent corrosion.
2. Exterior non-submerged steel shall be coated with one prime coat of Series 66 (4.0 to 6.0 DFT) and one finish coat of Series 71 (1.5 to 2.0 DFT).
3. Submerged steel (including steel subject to splashing) shall receive one prime coat of Series 1-4 (6.0 to 8.0 DFT), one finish coat of Series 1-4 (6.0 to 8.0 DFT), and areas exposed to sunlight shall receive an additional final coat of Series 71 (1.5 to 2.0 DFT) to one foot below the water surface.
4. The paint manufacturer's representative shall be on site prior to application of the first paint being applied to confirm the surface preparation and to ensure proper painting procedures. This will include a review of the painting equipment. Any deficiencies noted by the paint manufacturer's representative shall be corrected prior to application of any paint.

END OF SECTION