SECTION 460753 - PACKAGED WASTEWATER TREATMENT EQUIPMENT

Note that this section has only been edited for NYSOGS standardization and has not been technically edited. The designer shall make all technical edits specific to the project for this section.

This Section specifies packaged wastewater treatment equipment, based on a plant using the extended aeration process, with a capacity range of 3,000 to 150,000 gal. per day.

Check state and local requirements regarding design, installation, and permitting of wastewater treatment plant systems. Add specific state and local requirements as they apply to this Section.

1. GENERAL
   * + 1. SUMMARY
          1. Section Includes: Factory-built, welded-steel packaged wastewater treatment plant, with necessary tankage, capable of treating domestic wastewater by means of extended aeration activated sludge process.
          2. Related Requirements:

List other Sections directly related to or affecting Work of this Section. Include Sections specifying information expected to be found in this Section as well as Sections required to describe complete system or assembly requirements.

Section 033000 - Cast-In-Place Concrete: Concrete foundation for packaged wastewater treatment plant.

Section 055000 - Metal Fabrications: Miscellaneous metalwork and fasteners as required by this Section.

Section 134713 - Cathodic Protection: Passive cathodic protection to buried metallic utility piping, buried metal structures, and buried metal tanks using sacrificial galvanic anodes.

Section 262923 - Variable-Frequency Motor Controllers: Three-phase variable-frequency motor controllers of pulse-width-modulated design, for variable-speed drives.

Section 331416 - Site Water Utility Distribution Piping: Piping and accessories normally encountered with water distribution piping to connection with Site water distribution systems.

Section 400506 - Couplings, Adapters, and Specials for Process Piping: Piping components common to process piping systems.

Section 400551 - Common Requirements for Process Valves: Execution requirements for valves required by this Section.

Section 400593 - Common Motor Requirements for Process Equipment: Electric motors and their accessories normally supplied as part of equipment assemblies.

* + - 1. DEFINITIONS

Limit list of definitions to terms unique to this Section and not provided elsewhere.

* + - * 1. BOD5: Biochemical oxygen demand; amount of dissolved oxygen needed by aerobic biological organisms to break down organic material in the course of five days.
        2. CBOD: Carbonaceous biochemical oxygen demand; the depletion of dissolved oxygen by biological organisms in which the contribution from nitrogenous bacteria has been suppressed.
        3. Coliform Bacteria: General class of bacteria used as indicators of potential contamination of drinking water.
        4. Suspended Solids (SS): Small solid particles that remain in suspension in water.
        5. Total Kjeldahl Nitrogen (TKN): The sum of organic nitrogen, ammonia (NH3), and ammonium (NH4+) in the wastewater.
        6. Total Suspended Solids (TSS): All particles suspended in water that will not pass through a filter.
        7. Volatile Suspended Solids (VSS): The portion of suspended solids (SS) that will vaporize when heated to 1,112 degrees F; primarily organic material, which indicates the biomass present in the aeration tank.
      1. REFERENCE STANDARDS

List reference standards included within text of this Section, with designations, numbers, and complete document titles.

* + - * 1. American Society of Mechanical Engineers:

ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.

ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300.

* + - * 1. ASTM International:

ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

* + - * 1. American Welding Society:

AWS D1.1 - Structural Welding Code - Steel.

* + - * 1. National Electrical Manufacturers Association:

NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

* + - * 1. SSPC: The Society for Protective Coatings:

SSPC SP 10 - Near-White Metal Blast Cleaning.

* + - 1. COORDINATION
         1. Coordinate installation and startup of Work of this Section with [**Director’s Representative**] [**Director’s Representative**] <**\_\_\_\_\_\_\_\_**>.
      2. PREINSTALLATION MEETINGS
         1. Convene minimum [**one week**] <**\_\_\_\_\_\_\_\_**> [**weeks**] prior to commencing Work of this Section.
      3. SUBMITTALS

Only request submittals needed to verify compliance with Project requirements.

* + - * 1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
        2. Manufacturer’s installation instructions shall be provided along with product data.
        3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
        4. Product Data: Submit manufacturer's product data for system materials and component equipment.
        5. Shop Drawings:

Indicate system materials and component equipment, including detailed wiring and control diagrams.

Indicate complete information concerning fabrication, installation, anchoring, fasteners, and other details.

* + - * 1. Manufacturer's Certificate: Certify that [**products**] <**\_\_\_\_\_\_\_\_**> meet or exceed [**specified requirements**] <**\_\_\_\_\_\_\_\_**>.

Certify that installation is completed according to manufacturer's instructions and that packaged wastewater treatment plant is ready for startup, testing, and operation.

Submit manufacturer's affidavit certifying tanks have been designed to resist loading and attest to structural adequacy; calculations are not to be submitted.

Include separate Paragraphs for additional certifications.

Include following Paragraph when Contractor is responsible for designing products or assemblies. List affected products when Section specifies more than one product.

* + - * 1. Delegated Design Submittals: Submit signed and sealed Shop Drawings with design calculations and assumptions for tanks, railings, and other structural components.
        2. Manufacturer's Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures, anchoring, and layout.
        3. Source Quality-Control Submittals: Indicate results of [**shop**] [**factory**] tests and inspections.
        4. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
        5. Manufacturer Reports: Indicate results of manufacturer's inspections and instructions issued.
        6. Qualifications Statements:

Coordinate following Subparagraphs with requirements specified in QUALIFICATIONS Article.

Submit qualifications for manufacturer, installer, and licensed professional.

Submit manufacturer's approval of installer.

* + - 1. CLOSEOUT SUBMITTALS
         1. Project Record Documents: Record actual locations and final orientation of equipment and accessories.
         2. Operation and Maintenance Data: Submit equipment operation and maintenance manuals.

Include periodic maintenance recommendations.

Submit list of equipment, accessories, and tools needed to maintain and calibrate equipment.

* + - 1. MAINTENANCE MATERIAL SUBMITTALS
         1. Spare Parts:

Furnish [**one set**] [**two sets**] of manufacturer's recommended spare parts, including:

Four spare diffusers of each type and size.

Two sets of belts for each motor.

[**Two**] <**\_\_\_\_\_\_\_\_**> spare tube assemblies for solution feed pump.

* + - * 1. Tools: Furnish special [**wrenches**] <**\_\_\_\_\_\_\_\_**> and other devices required for Director’s Representative to maintain system components.
      1. QUALITY ASSURANCE

Include this Article to specify compliance with overall reference standards affecting products and installation included in this Section.

In following Paragraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

* + - * 1. Perform Work according to <**\_\_\_\_\_\_\_\_**> standards.

Include following Paragraph only when cost of acquiring specified standards is justified.

* + - * 1. Maintain <**\_\_\_\_\_\_\_\_**> [**copy**] [**copies**] of each standard affecting Work of this Section on Site.
      1. QUALIFICATIONS

Coordinate following Paragraphs with the requirements specified in SUBMITTALS Article.

* + - * 1. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum [**three**] <**\_\_\_\_\_\_\_\_**> years' [**documented**] experience.
        2. Installer: Company specializing in performing Work of this Section with minimum [**three**] <**\_\_\_\_\_\_\_\_**> years' [**documented**] experience [**and approved by manufacturer**].
        3. Licensed Professional: [**Professional engineer**] <**\_\_\_\_\_\_\_\_**> experienced in design of specified Work and licensed in the State of New York.
        4. Welders: AWS-certified within previous 12 months.
      1. WARRANTY

This Article extends warranty period beyond one year. Extended warranties may increase construction costs and Director’s Representative enforcement responsibilities. Specify warranties with caution.

* + - * 1. Furnish [**five**] <**\_\_\_\_\_\_\_\_**>-year manufacturer's warranty for packaged wastewater treatment equipment.

1. PRODUCTS
   * + 1. PACKAGED PLANT WASTEWATER TREATMENT SYSTEM
          1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=9586&mf=04&src=wd):

Designer to provide two manufacturers and approved equivalent for all listed products.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

In following Paragraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

* + - * 1. Furnish materials according to <**\_\_\_\_\_\_\_\_**> standards.

Insert descriptive specifications below to identify Project requirements and to eliminate conflicts with products specified above. Include configuration, size, color, material composition, and other properties needed to describe product.

* + - * 1. Description:

Factory-built packaged wastewater treatment plant constructed of minimum 1/4-inch -thick welded-steel plate, consisting of common aeration chamber (tank), clarifier chamber, sludge-holding chambers, [**integral**] [**separate**] chlorine contact tank; and [**separate**] [**integral**] comminutor chamber.

System components include froth control system, air diffuser piping, airlift sludge returns, airlift skimmers, valves, internal piping, chlorine tablet dispensing system, blowers, and electrical system.

Include grating for operating floor[**, stair,**] and peripheral railing.

* + - * 1. Performance and Design Criteria:

Influent Criteria:

Average Daily Flow Rate: <**\_\_\_\_\_\_\_\_**> gpm.

Maximum Daily Flow Rate: <**\_\_\_\_\_\_\_\_**> gpm

BOD5: <**\_\_\_\_\_\_\_\_**>

SS: <**\_\_\_\_\_\_\_\_**>

TKN: <**\_\_\_\_\_\_\_\_**>

Phosphorus (P): <**\_\_\_\_\_\_\_\_**>

Performance Criteria: Produce effluent quality from treatment plant final clarifier with following maximum limits:

CBOD: <**\_\_\_\_\_\_\_\_**> summer, <**\_\_\_\_\_\_\_\_**> winter.

TSS: <**\_\_\_\_\_\_\_\_**>

TKN: <**\_\_\_\_\_\_\_\_**> summer only.

P: <**\_\_\_\_\_\_\_\_**>

Dissolved Oxygen (DO): <**\_\_\_\_\_\_\_\_**> summer, <**\_\_\_\_\_\_\_\_**> winter (daily minimum).

Fecal Coliforms: <**\_\_\_\_\_\_\_\_**> monthly average, <**\_\_\_\_\_\_\_\_**> daily maximum (colonies/mL).

pH: <**\_\_\_\_\_\_\_\_**> daily minimum; <**\_\_\_\_\_\_\_\_**> daily maximum.

Provide ferric chloride addition at locations indicated on Drawings to achieve P reduction.

Unit Design Criteria:

Provide aeration system with minimum detention period of 24 hours based on design flows, capable of achieving <**\_\_\_\_\_\_\_\_**> percent reduction in daily organic loadings of BOD5.

Maximum organic loading on aeration system <**\_\_\_\_\_\_\_\_**> lb. BOD5/1,000 cu. ft. based on <**\_\_\_\_\_\_\_\_**> mg/day at <**\_\_\_\_\_\_\_\_**> lb. BOD5/day

Size aeration tank with minimum side water depth of <**\_\_\_\_\_\_\_\_**> feet

Base clarifier design parameters on following calculated at 100 percent of specified daily design flows with 100 percent return-sludge rate:

Hydraulic Surface Loading Rate: <**\_\_\_\_\_\_\_\_**> gal./day/sq. ft.

Solids Loading: <**\_\_\_\_\_\_\_\_**> lb./day/sq. ft.

Weir Loading: <**\_\_\_\_\_\_\_\_**> gal./day/ft.

Size sludge-holding tank based on following design criteria in addition to specified hydraulic and solids loadings:

<**\_\_\_\_\_\_\_\_**> percent BOD5 removal in aeration system.

<**\_\_\_\_\_\_\_\_**> percent VSS.

<**\_\_\_\_\_\_\_\_**> percent inorganic SS.

<**\_\_\_\_\_\_\_\_**>-day minimum detention time.

Decanted waste sludge concentration of <**\_\_\_\_\_\_\_\_**> percent.

VSS loading of less than <**\_\_\_\_\_\_\_\_**> lb. VSS/cu. ft./day

Minimum side water depth of <**\_\_\_\_\_\_\_\_**> feet

* + - 1. EQUALIZATION CHAMBERS
         1. Furnish chamber as integral part of packaged wastewater treatment plant; chamber minimum capacity of <**\_\_\_\_\_\_\_\_**> gal. but not less than required to meet performance requirements.
         2. Fillet each side of chamber at bottom to prevent sludge accumulation to enhance rotation of tank contents and prevent scum and froth accumulation.
         3. Control air volume introduced longitudinally near bottom of chamber to ensure adequate mixing and cleansing velocities within aeration chamber and maintenance of solids in suspension.
         4. Furnish submersible duplex pumps and ancillary pump components to meet performance requirements.
         5. Pump Control: Liquid level sensors.
         6. Provide inlet trough with flow control box and emergency overflow pipe.
      2. AERATION CHAMBERS
         1. Size capacity of aeration chambers to meet performance requirements.
         2. Filleted on each side of chamber at bottom to prevent sludge accumulation to enhance rotation of tank contents and prevent scum and froth accumulation.
         3. Control air volume introduced longitudinally near bottom of chamber to ensure adequate mixing and cleansing velocities within aeration chamber and maintenance of solids in suspension.

Two independently operated clarifiers may be required by authorities having jurisdiction, depending on the flow rate. Verify Project requirements before editing Article below.

* + - 1. SECONDARY CLARIFIER
         1. Size clarifier chamber to meet performance requirements; total settling volume to include volume of upper one-third of sludge hopper; bottom of chamber formed into inverted pyramidal hopper or hoppers with flat bottom area of each hopper being approximately <**\_\_\_\_\_\_\_\_**> sq. ft.; slope of hopper walls to be not less than 1.7 vertical to 1.0 horizontal.
         2. Equip clarifier with airlift pumps, <**\_\_\_\_\_\_\_\_**>-inch minimum diameter, to return settled sludge and floating materials to aeration chamber; sludge-return airlifts equipped with valves to permit wasting of excess sludge to sludge-holding tank.
         3. Design sludge-return airlift pumps' adjustable recirculation capacity of at least 100 percent of 24-hour design flow.
         4. Equip pumps with cleanout plugs to allow for cleaning and maintenance.
         5. Furnish valves on air line to vary air volume to each pump.
         6. Support airlift pump.
         7. Equip clarifier with baffle and effluent weir trough; mount weir to permit height adjustment for maintaining proper fluid level.
      2. FLOW METERING
         1. Bolt and weld weir box to end of final clarifier effluent trough.
         2. Weir plate:

Configuration: 1/4-inch-thick aluminum, held in weir box in stop-gate grooves.

V-notch: 22 inches deep, with bottom of notch approximately 5 inches above floor of chamber and invert of outlet pipe.

* + - * 1. Align clarifier effluent trough invert and bottom of weir V-notch at same elevation.
        2. Wastewater Flow Measurement: Record flow in gpm using following:

Measure plant-effluent flow with open-channel ultrasonic flow meter. Flow meter consists of ultrasonic transducer, temperature sensor, electronic transmitter, and interconnecting cables.

Mount ultrasonic transducer above V-notch outfall weir to measure head over V-notch weir.

Transmit and receive acoustical signal to accurately measure liquid level.

Sense range from zero to 12 inches and operate over ambient temperature range of minus 40 to plus 200 degrees F

Furnish temperature sensor with transducer to sense ambient temperature and compensate level reading based on temperature. Mount temperature sensor above flume.

Furnish necessary mounting hardware for ultrasonic transducer and temperature sensor.

Furnish length of cables required to connect ultrasonic transducer and temperature sensor to transmitter.

Transmitter: Solid state to display plant-effluent flow rate and output on isolated 4- to 20-mA DC signal proportional to flow rate. Operate transmitter on 120 V ac and house in NEMA 250 4X enclosure.

* + - 1. SKIMMING DEVICE
         1. Furnish airlift skimming device located in clarifier to skim and return floating material to aeration chamber; equip air-supply line with needle valve to regulate rate of return.
      2. SLUDGE-HOLDING CHAMBER
         1. Description:

Furnish aerated sludge-holding chamber as integral part of packaged wastewater treatment plant.

Minimum Capacity: <**\_\_\_\_\_\_\_\_**> gal.

* + - * 1. Sizing of air-supply piping and distribution devices by equipment manufacturer.
        2. Furnish valves to divert return sludge from aeration tanks to sludge-holding tank.
        3. Furnish supernatant return pipe to return supernatant to aeration tank.
        4. Furnish sludge-withdrawal pipe to permit sludge removal from sludge-holding tank.
      1. POST-AERATION CHAMBER
         1. Furnish post-aeration chamber as integral part of packaged wastewater treatment plant, to meet performance requirements.
      2. CHLORINE CONTACT TANK

Select integral or separate chlorine contact tank or retain both when manufacturer is permitted to make selection.

* + - * 1. Description:

Furnish integral chlorine contact tank to packaged wastewater-treatment plant.

Chlorine Contact Time: <**\_\_\_\_\_\_\_\_**> minutes.

Minimum Capacity: <**\_\_\_\_\_\_\_\_**> gal.

Furnish baffle as indicated on Drawings to prevent short circuiting and to ensure positive mixing.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - * 1. Description:

Furnish separate remote steel chlorine tank.

Minimum Capacity: <**\_\_\_\_\_\_\_\_**> gal.

Furnish baffles to prevent short circuiting and to ensure positive mixing as indicated on Drawings.

* + - * 1. Furnish effluent V-notch weir at discharge end of chlorine contact tank; size and location of V-notch weir as indicated on Drawings.

Select chlorinator or hypochlorinator in one of following Articles.

* + - 1. CHLORINATOR
         1. Furnish tablet-type chlorinator, adjustable, flow regulated, dispensing predetermined quantity of disinfecting tablets, capable of treating entire flow of wastewater passing through chlorinator.
         2. Furnish chlorinator constructed of molded fiberglass and PVC; minimum [**2**] [**3**] [**4**] feed tubes, each capable of holding <**\_\_\_\_\_\_\_\_**> tablets, <**\_\_\_\_\_\_\_\_**> oz.; <**\_\_\_\_\_\_\_\_**>-inch diameter with removable top cover.
         3. Slotted lower end of each tube to permit free flow of water through tubes to ensure positive contact between water and disinfectant tablets.
         4. Furnish fixed <**\_\_\_\_\_\_\_\_**>-inch weir at outlet end to control water level in chlorinator.
         5. Inlet Pipe Size: <**\_\_\_\_\_\_\_\_**>-inch diameter.
         6. Furnish chlorinator with supports and anchored-to-tank mounted brackets with minimum of four cadmium-plated bolts of size to snugly fit chlorinator anchor holes.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - 1. HYPOCHLORINATOR
         1. Mount chlorinator system on treatment tank with combination solution feed tank and equipment compartment. Furnish housings, tank, and covers constructed of 1/4-inch -thick fiberglass with foam insulation.
         2. Solution Feed Tank Capacity: <**\_\_\_\_\_\_\_\_**> gal.
         3. Covers:

Furnish slide tank cover in stainless steel guides.

Equip tank cover with chromium-plated, fixed-cam lock with two keys.

Furnish equipment compartment with removable cover, with lock and keys identical to solution tank lock and keys.

* + - * 1. Solution Feed Pump:

Type: Positive-displacement peristaltic tube, with no check valves, seals, diaphragms, or strainers in line or in pump unit.

Motor: <**\_\_\_\_\_\_\_\_**> hp, <**\_\_\_\_\_\_\_\_**> volts, 60 Hz, single phase.

Fittings and Tubing: Plastic.

* + - * 1. Furnish [**one**] <**\_\_\_\_\_\_\_\_**> 24-hour electrical time switch and one thermostat-controlled space heater, mounted in equipment compartment, to maintain <**\_\_\_\_\_\_\_\_**> degrees F with outside temperature of <**\_\_\_\_\_\_\_\_**> degrees F
        2. Furnish junction box on exterior of fiberglass housing for exterior power connections.
      1. FROTH CONTROL SYSTEM
         1. Furnish factory-installed and -tested froth control system with necessary pumps, nozzles, piping, valving, and controls capable of controlling frothing or foaming in aeration chamber.
         2. Pump water used for controlling frothing or foam formation to aeration chamber spray header by means of one heavy-duty submersible wastewater pump located in clarifier chamber.
         3. Nozzles:

Introduce pump water from clarifier chamber into aeration chamber through spray nozzles attached to spray header.

Corrosion-free, counter-weighted-type nozzles, with flip-open cap for quick flush cleaning of <**\_\_\_\_\_\_\_\_**>-inch -diameter nozzle orifice.

Nozzles: Flat, hard spray pattern when discharging approximately <**\_\_\_\_\_\_\_\_**> gpm at <**\_\_\_\_\_\_\_\_**> psig at <**\_\_\_\_\_\_\_\_**>-foot intervals along entire length of aeration tank.

* + - 1. PIPING
         1. Furnish piping, valving, and fittings from froth-control pump to spray header and from blowers to aeration tank diffusers, sludge-holding tank diffusers, return-sludge airlifts, and scum skimmer.
         2. Furnish necessary taps in each blower-discharge pipe for future mounting of pressure gage, thermometer, and pressure switch. Furnish tap in blower intake pipe for mounting pressure gage.
         3. Pipe: ASTM A53, black steel, Grade B, seamless, Schedule 40.
         4. Fittings:

Threaded:

Material: Malleable iron.

Comply with ASME B16.3.

Class: 150.

Flanged:

Material: Cast iron.

Comply with ASME B16.1.

Class: 125.

Unions: Threaded, malleable iron.

* + - * 1. Furnish unions at drop pipes and adjacent to valves, to facilitate piping disassembly.
        2. Verify that piping has been subjected to pressure test and has satisfactorily withstood tests.
      1. AIR DIFFUSION SYSTEM
         1. Furnish blower and associated appurtenances to supply air to aeration tank diffusers, sludge-holding tank diffusers, return-sludge airlifts, and scum skimmer.
         2. Minimum Air Requirements:

Aeration Tank: 2,100 cu. ft. of air per pound of BOD5 applied, and minimum of 2 cfm per diffuser, over length of aeration tank.

Sludge-Holding Tank: 15 cfm per diffuser, over length of sludge-holding tank.

Return-Sludge Airlifts: Adequate air flow rate to meet minimum recirculation rates as specified in this Section.

Scum-Skimming Device: Furnish air flow rate to skim and return floating material from settling tank to aeration tank.

[**Post-Aeration Tank: Furnish minimum of 5-cfm air flow to be routed to post-aeration diffuser.**]

* + - * 1. Discharge pressure rating of blowers determined by packaged wastewater treatment plant manufacturer based on piping sizes and configurations.
        2. Blower:

Positive-displacement, constant-volume, continuous-service, horizontal-flow, rotary-lobe type.

Mount blower on two formed-steel rail supports with forward or reverse adjustment of blower, with respect to plane of V-belts.

Furnish intake side of blower with dry, pleated-paper-element-type media capable of being cleaned and reused; 98 percent minimum rated efficiency on 2-micron and larger particles.

Tap discharge pipe for weight-loaded pressure relief valve with removable weights machined for pressure adjustment in 2-psi increments.

Furnish weight-loaded cap to lift off valve seat upon pressure increase and automatically reseat with line pressure reduction.

Connect discharge pipe to pipe feeding main air header with flexible connections of fiberglass-impregnated silicone rubber, double-lock-strap-type clamps, stainless steel bands, and hex-head slotted screws; minimum 40 psig and 300 degrees F rated.

Rotors: Symmetrical, two-lobe, involute type machined from close-grained cast iron to exact involute shape.

Lobes: Integrally cast or attached to steel shafts.

* + - * 1. Housing:

Weatherproof, insulated for less than 85 dB based on open field test measured at distance of 9 feet from blower.

Steel: <**\_\_\_\_\_\_\_\_**> gage, phosphatized and double coated with baked-enamel finish.

Hinge housing at one end of frame to allow lifting of housing to reveal interior components.

* + - * 1. Frame:

One-piece, full-length fabricated steel; non-warping; enameled finish.

Design minimum deflection under full-load torque and pulsation.

* + - * 1. Motor: As specified in Section 400593 - Common Motor Requirements for Process Equipment.

Insert electrical characteristics.

Ball-bearing, horizontal, solid-shaft, totally enclosed, fan-cooled, <**\_\_\_\_\_\_\_\_**>-volt, <**\_\_\_\_\_\_\_\_**>-phase, 60-Hz motor.

Constant-speed NEMA Design B, Class B, continuous-duty motor with 1.15 service factor at <**\_\_\_\_\_\_\_\_**> degrees F ambient.

Mount motor on two formed-steel rail supports with forward or reverse adjustment to maintain belt tension.

Drive blower motor by means of properly sized sheaves and V-belts.

* + - * 1. Mount blowers on packaged wastewater treatment plant at location indicated on Drawings.
        2. Air Diffusers:

Fine-bubble diffusers might be wanted in aeration, because diffusers can be removed. Coarse bubble diffusers are typical for sludge-holding tanks.

Aeration and Sludge-Holding Tank Air Diffusers: [**Fine**] [**Coarse**] bubble type.

Ensure that diffuser spacing and air velocity provide adequate mixing velocities within aeration tank and sludge-holding tank to prevent dead spots and maintain cleansing velocities.

Furnish diffusers parallel to and near base of fillet and at an elevation that provides optimum diffusion and mixing of tank contents.

Furnish diffuser assembly capable of being removed without draining tank and equipped with air-regulating valve to permit adjustment of air flow or complete shutoff.

Diffuser: [**Plastic**] [**Stainless steel**] <**\_\_\_\_\_\_\_\_**> with neoprene cap, providing positive check against liquid entering diffuser and air lines while blower is not running.

Diffuser Tubes: Composed of [**modified acrylonitrile-styrene copolymer material**] [**modified acrylonitrile-butadiene-styrene terpolymer**] in form of uniformly sized spheres linked at their points of contact by special process to ensure high structural stability; lightweight tubes to facilitate handling.

Tubes:

Free from loose, unbonded material capable of affecting normal and proper operation.

Free of cracks, soft spots, chipping, spalling, or other defects.

Uniform throughout entire structure and free from holes and impervious material capable of causing unequal distribution of air.

Maximum Head Loss through Diffuser Assembly: <**\_\_\_\_\_\_\_\_**> inches of water at air flow rate of <**\_\_\_\_\_\_\_\_**> scfm per diffuser at submergence of <**\_\_\_\_\_\_\_\_**> feet.

Diffuser Assembly: Oxygen transfer efficiency of 6 percent at air flow rate of <**\_\_\_\_\_\_\_\_**> scfm per diffuser at diffuser submergence of <**\_\_\_\_\_\_\_\_**> feet; with transfer efficiency determined by unsteady state method in clear tap water at <**\_\_\_\_\_\_\_\_**> degrees F and zero dissolved oxygen in full-scale tank.

Diffuser: <**\_\_\_\_\_\_\_\_**>-inch diameter male NPT connection.

* + - 1. COMMINUTOR AND BAR SCREEN
         1. Comminutor: Motor-driven unit to reduce organic solids in wastewater to <**\_\_\_\_\_\_\_\_**>-inch size or smaller, permitting passage through <**\_\_\_\_\_\_\_\_**>-inch slots in rotating cylindrical wastewater screen.
         2. Operate comminutor continuously and automatically; capable of passing flow rates of up to <**\_\_\_\_\_\_\_\_**> gpm.

Select cast-aluminum construction in first Paragraph below or steel construction in second Paragraph.

* + - * 1. Construction:

Motor-driven, cast aluminum; revolving screen equipped with carbon-chrome steel cutters.

Carbon-chrome stationary cutter mounted on cast-aluminum alloy frame.

Readily removable as a unit from its drum housing without disturbing plant operations.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - * 1. Construction:

Motor-driven, cast aluminum; revolving screen equipped with carbon-chrome stationary cutter mounted on steel frame.

Readily removable as a unit from its drum housing without disturbing plant operations.

Frame coated with coal-tar epoxy for corrosion resistance.

* + - * 1. Wastewater Flow: Comminutor entry through <**\_\_\_\_\_\_\_\_**>-inch -diameter open-top inlet trough, passing through <**\_\_\_\_\_\_\_\_**>-inch slots in revolving screen and discharging through bottom of drum housing.
        2. During prolonged power outages and plugging of screen, permit wastewater to overflow open-top inlet trough into plant.
        3. Furnish automatic, overload-type reversing device with momentary time delay to prevent jamming or damage to unit when exceptionally hard object is encountered in wastewater.
        4. Controls:

Main disconnect; HAND OFF-AUTO control station and full-voltage; forward-reversing starter, with solid-state jam detector with built-in, reversing, and adjustable time-delay circuit.

Jam Detector: Magnetic-type current pick-up loop capable of operating in ambient temperature range of minus <**\_\_\_\_\_\_\_\_**> degrees F to plus <**\_\_\_\_\_\_\_\_**> degrees F.

* + - * 1. Trip Rating: Adjustable from 80 to 120 percent of full-load current.
        2. Rate components for 600-volt operation; motor contactors horsepower rated.
        3. Control Enclosure: NEMA 250 3R and bracket mounted directly to comminutor speed reducer.
        4. Comminutor Gear Motor:

As specified in Section 400593 - Common Motor Requirements for Process Equipment.

<**\_\_\_\_\_\_\_\_**> hp, totally enclosed non-ventilated, for service voltage of <**\_\_\_\_\_\_\_\_**> volt, three phase, 60 Hz.

Mount motor and gear-reduction unit directly on wastewater grinder.

Produce <**\_\_\_\_\_\_\_\_**> rpm through [**right angle**] [**vertical**], flange-mounted[**, double**] [**, single**]-reduction gear unit.

* + - * 1. Speed Reducer:

Design to allow motor to be removed for repair or replaced without disturbing gear-reduction portion of drive unit.

Mount vertically in line.

* + - * 1. Motor: Inherently manual reset overload protection by means of built-in thermal cutout.
        2. Furnish comminutor in submerged bar screen within plant.
        3. Bar Screen:

Submerged type with <**\_\_\_\_\_\_\_\_**>-inch bars spaced <**\_\_\_\_\_\_\_\_**> inches apart as indicated on Drawings.

Factory install bar screen within aeration tank at influent port.

Include drying deck with drain for drying debris from raked up-sloping bars.

Paint with two coats of coal-tar epoxy, each coat <**\_\_\_\_\_\_\_\_**> mil for total <**\_\_\_\_\_\_\_\_**>-mil dry film thickness.

* + - 1. GRATINGS, HANDRAILS, AND ACCESS STAIRS
         1. Gratings:

Fiberglass-reinforced plastic grating panels [**with slip-resistant surfaces,**] covering entire interior surface of clarifiers and filters.

Delete following Article when tanks are built above grade.

* + - 1. CATHODIC PROTECTION
         1. As specified in Section 134713 - Cathodic Protection.
      2. FASTENERS AND LIFTING LUGS
         1. Lifting Lugs: Furnish lifting lugs to facilitate field installation of tanks; locate and reinforce to enable lifting of assemblies without causing structural damage to units.
         2. Fasteners: As specified in Section 055000 - Metal Fabrications.
      3. FABRICATION
         1. Assemble complete packaged wastewater treatment plant at factory to ensure fitting of units, piping, and equipment prior to shipment.
      4. FINISHES
         1. Blast clean ferrous metal surfaces to SSPC SP 10 near-white blast after fabrication.
         2. Shop-apply one coat of coal-tar epoxy finish, 16-mil dry film thickness to interior wetted surfaces.
         3. Shop-apply two coats of coal-tar epoxy-polyamide finish, <**\_\_\_\_\_\_\_\_**> mil dry film thickness each coat, to exterior surfaces.
         4. Motors, Electrical Components, and Control Cabinets: Manufacturer's standard finish.

ASTM A123 includes minimum-coating-thickness grade based on type of material and steel thickness of component.

* + - * 1. Galvanizing: ASTM A123; hot-dip galvanized after fabrication.
        2. Galvanizing for Nuts, Bolts, and Washers: ASTM A153
      1. SOURCE QUALITY CONTROL

Include one or both of following Paragraphs to require Director’s Representative inspection or witnessing of test at factory.

* + - * 1. Director’s Representative Inspection: Make completed assembly available for inspection at manufacturer's factory prior to packaging for shipment. Notify Director’s Representative at least [**seven**] <**\_\_\_\_\_\_\_\_**> days before inspection is allowed.
        2. Director’s Representative Witnessing: Allow witnessing of factory inspections, and test at manufacturer's test facility. Notify Director’s Representative at least [**seven**] <**\_\_\_\_\_\_\_\_**> days before inspections and tests are scheduled.

Include following Paragraph when reliance on fabricator's approved quality-

control program is sufficient for Project requirements.

* + - * 1. Certificate of Compliance: When fabricator is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at fabricator's facility conforms to Contract Documents.

Specified shop tests are not required for Work performed by approved fabricator.

1. EXECUTION
   * + 1. EXAMINATION
          1. Verify layout and orientation of treatment unit, accessories, and piping connections.
          2. Verify that foundation is installed with anchor bolts correctly located.
       2. INSTALLATION
          1. Erect packaged wastewater treatment unit on foundation according to Drawings and manufacturer's installation instructions.
          2. Complete joint-penetration welds, double welded from both sides for field joining of shop-fabricated tank units and structural attachments.
          3. Complete bolting to connect tanks and to mount equipment.
          4. Install blower and motor assembly, piping, and appurtenances as indicated on Drawings and according to manufacturer's instructions.

Install and connect piping, accessories, and power as required to ensure complete, operable air handling system.

* + - * 1. Handrail Posts and Rails: Install plumb and in straight line along run.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

In following Paragraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

* + - * 1. Installation Standards: Install Work according to <**\_\_\_\_\_\_\_\_**> standards.
      1. FIELD QUALITY CONTROL
         1. Welding:

If welds show evidence of leaking, empty tank and repair welds.

Remove defective welds by chipping or by arc or carbon gouging.

* + - * 1. Startup and Performance Testing:

Performance Testing of Treatment Unit:

After field adjustments are completed, test treatment unit under operating conditions continuously for three consecutive days to demonstrate unit compliance with design criteria, and permit discharge limitations.

Testing for influent and effluent BOD5, SS, TKN, and P concentration.

Take one sample of influent and effluent at 8:00 AM and 4:00 PM on each of three days for total of six influent and six effluent samples.

Conduct sampling under supervision of manufacturer's field representative and in presence of the Director’s Representative.

When wastewater treatment plant does not meet specified performance criteria within 60 days, modify system to meet performance criteria and rerun performance test; equipment modifications are subject to approval of Director’s Representative.

When wastewater treatment unit fails to meet specified performance criteria within 60 days, remove unit from Project Site and replace with unit capable of meeting performance criteria, at no additional cost to Director’s Representative.

Performance Testing of Blower Unit:

Check correct rotation of blower motor; adjust V-belt tensioning and alignment; ensure proper blower and motor lubrication.

Run each blower unit under direction of manufacturer's representative for period of four continuous hours to demonstrate correct alignment, smooth operation, and freedom from vibration, noise, and overheating; take motor amp readings to demonstrate motor is not overloading.

Test in presence of the Director’s Representative.

Measure following, using metering devices to determine conformance with performance requirements:

Blower and motor rpm.

Discharge-air volume and pressure.

Relief valve settings.

When components fail to perform as specified or are defective, correct deficiencies and rerun performance test.

Equipment modifications are subject to approval of Director’s Representative.

* + - * 1. Manufacturer Services:

Furnish services of manufacturer's representative experienced in installation of products furnished under this Specification for not less than <**\_\_\_\_\_\_\_\_**> days on Site for installation, inspection, field testing, and instructing Director’s Representative personnel in maintenance of equipment.

Demonstrate equipment startup, shutdown, routine maintenance, alarm condition responses, and emergency repair procedures to Director’s Representative personnel.

END OF SECTION 460753