GENERAL

The contractor shall furnish and install one complete Extended Aeration wastewater treatment facility to provide secondary treatment of the daily wastewater flow. Principal items of equipment shall include precast concrete aeration and clarification chambers, air distribution system, air diffusion system, airlift sludge return system, airlift surface skimming system, mechanical equipment and equipment housing, electrical controls, galvanized metal grating with master-keyed locking device for all tank openings, and all necessary internal piping and mechanical equipment as described in the following specifications and as manufactured by Norweco, Inc., Norwalk, Ohio, U.S.A.

Treatment of the daily wastewater flow shall be accomplished by the Extended Aeration process. Other variations of the Activated Sludge process such as Contact Stabilization, Step Aeration, etc., are more susceptible to toxic and hydraulic upsets and shall not be considered for this application.

Biological treatment shall be accomplished in the aeration chamber of the facility. Influent wastewater shall enter and be retained in the aeration chamber for twenty-four hours. Air shall be introduced along one wall near the bottom to produce a mixing and rolling action in the tank. Two thousand-one hundred cubic feet of air shall be pumped into the aeration chamber for each pound of BOD applied per day. The spiral rolling action created by the introduction of air shall insure thorough mixing of the incoming organic material with the activated sludge present in the chamber. In addition, the spiral flow pattern shall prevent short circuiting of the flow and assure adequate retention of all organic materials.

Gravity settling of the mixed liquor suspended solids shall be accomplished in the clarification chamber. Mixed liquor shall be transferred from the aeration chamber into the clarification chamber by hydraulic displacement. The effective holding capacity of the clarifier shall be calculated after excluding the lower two-thirds, by height, of each hopper and shall be of sufficient volume to provide in excess of four hour retention of the daily flow. The chamber shall be designed so that the clarifier will successfully perform its function of solids separation without hydraulic upset even when the significant runoff period is eight hours.

The Extended Aeration wastewater treatment facility shall provide an anticipated eighty-five to ninety-five percent removal of BOD and suspended solids. Net sludge volume increases shall be nominal and should range from zero to one percent depending on influent characteristics. Capability of a plant of this type to perform as outlined, when built by an approved manufacturer, shall be certified by an independent testing laboratory. The manufacturer shall make certified data available to the regulatory agency, customer, consultant and contractor as required.

The wastewater treatment facility structure shall be reinforced to withstand normal pressures from external soil and internal hydrostatic loads. To eliminate any possibility of differential settling of the tankage, the contractor shall install a six inch thick leveling pad of sand or stone in the bottom of the excavation prior to tank setting.

OPERATING CONDITIONS

The wastewater treatment facility shall be a Norweco Model _____ as shown on Drawing Number _____

capable of treating _____ gallons per day of sanitary sewage. This facility shall be designed and built to serve a population equivalent of _____ with a total loading and treatment capability of _____ pounds of five day BOD per day.

AERATION

The aeration chamber shall have a capacity of _____ gallons to provide twenty-four hour retention of the daily wastewater flow. The chamber shall be of sufficient size to provide a minimum of eighty cubic feet of tank capacity per pound of applied BOD. Concrete fillets shall be installed in the bottom of the chamber parallel to the treatment flow to insure uniform tank roll and prevent deposition of solids. Overall design of the chamber shall be such that effective mixing shall be maintained to provide optimum treatment.

The chamber shall be constructed of properly reinforced five thousand PSI, twenty-eight day compression strength precast concrete. Each casting used to construct the chamber shall be a monolithic unit with all four walls incorporated into each tank section. Individual tank sections shall be joined with a horizontal tongue and groove joint. To insure the watertight integrity of the finished structure, each joint shall be sealed with a self-adhering compression gasket. The gasket shall be of a resilient, synthetic, self-sealing material. Non-compression joints with grouted sealing compounds shall not be used.

AIR DISTRIBUTION SYSTEM

Galvanized schedule forty steel pipe and galvanized malleable iron pipe fittings shall be used throughout the air distribution system. Individual galvanized pipe unions, dresser couplings and flexible couplings with stainless steel clamps shall be provided as necessary in the air distribution system. Individual air control valves shall be installed in the air distribution piping as required to allow adjustment of each separate element within the system.

Primary air distribution shall be accomplished through a galvanized air header. Air shall be introduced into the aeration chamber utilizing Norweco Evenair™ diffuser assemblies. Individual drop pipes to each diffuser assembly shall be connected to the air header with a galvanized quick release coupling or union. Each drop pipe shall be equipped with an air adjustment valve upstream of the quick release coupling allowing individual air adjustment and distribution balance.

AIR DIFFUSION SYSTEM

Norweco Evenair™ diffusers shall be installed parallel to the treatment flow in each aeration chamber. Each diffuser assembly shall be installed not more than twelve inches off the floor of the chamber nor more than twelve inches away from the chamber sidewall. Evenair™ diffusers shall be constructed of schedule eighty polyvinyl chloride (PVC) plastic and shall be designed to insure uniform mixing within the aeration chamber. Fine air bubble distribution effected by the diffusers shall be adequate to provide all oxygen necessary for the aerobic digestion process while maintaining an acceptable dissolved oxygen level in the final plant effluent. Arrangement of Norweco Evenair™ diffusers shall be consistent throughout the aeration chamber and shall provide at least one air diffusion orifice for each five inches of aeration chamber length.

WASTEWATER TREATMENT PLANT SPECIFICATIONS

CLARIFICATION

A final clarification chamber shall be provided for gravity settling of the mixed liquor suspended solids. It shall have a total holding capacity of _____ gallons. Effective holding capacity of the clarifier shall be at least _____ gallons when calculated after excluding the lower two-thirds, by height, of each hopper. The effluent weir shall be of sufficient length to provide an overflow rate of _____ gallons per lineal foot per day and surface area of the tank shall provide a settling rate of _____ gallons per square foot per day.

The clarification chamber shall be constructed of properly reinforced, five thousand PSI, twenty-eight day compression strength precast concrete. Each casting used to construct the chamber shall be a monolithic unit with all four walls incorporated into each tank section. Individual tank sections shall be joined with a horizontal tongue and groove joint. To ensure the watertight integrity of the finished structure, each joint shall be sealed with a self-adhering compression gasket. The gasket shall be of a resilient, synthetic, self-sealing material. Non-compression joints with grouted sealing compounds shall not be used.

The clarification chamber shall consist essentially of four independent zones operating conjunctively to provide satisfactory solids separation. An inlet baffle zone shall be provided at the flow inlet to the clarification chamber. All transfer turbulence shall be dissipated in this zone to preserve quiescence downstream of the baffle. The area contained behind the baffle shall provide sufficient capacity to allow surfacing of all buoyant material entering the clarifier. The baffle shall extend a minimum of six inches above the liquid surface to entrap all floating material and shall extend a minimum of two inches below the transfer port invert to eliminate the passage of buoyant material or surface turbulence.

Flow shall be directed out of the inlet baffle zone into the hopper zone. All transfer shall be accomplished below the bottom of the inlet baffle into the upper one-third area of the hopper zone. In this zone sludge shall settle by gravity to the bottom of the hopper. Each hopper shall have sloping sidewalls directing all sludge to the bottom near the airlift pump inlet. Maximum area at the base of each hopper shall be one square foot and all sidewalls forming the hopper shall have a side slope of at least sixty degrees. The settled sludge shall be returned to the inlet end of the aeration chamber by continuous airlift pumping.

Clarified liquids shall be contained in the settling zone above the hopper area for additional gravity settling. Liquids in the settling zone shall be hydraulically displaced to the outlet zone. The outlet zone shall consist of an adjustable sideplate effluent weir trough and outlet baffle. The outlet baffle shall extend a minimum of four inches below and six inches above the liquid surface. The baffle shall span the entire length of the outlet zone and shall totally separate the surface liquids of the settling and outlet zones. Centered in the outlet zone parallel to the outlet baffle shall be an aluminum effluent weir trough with two adjustable v-notch sideplates. The trough shall be capable of being adjusted from end-to-end to provide adequate fall to the plant outlet. The sideplates shall be capable of being levelled from side-to-side and end-to-end to provide a uniform flow line elevation.

AIRLIFT SLUDGE RETURN SYSTEM

A galvanized airlift sludge return pump shall be provided for each hopper in the clarification chamber. Air shall be supplied to the airlift through a secondary air distribution system connected to the main air header of the treatment plant. Individual air manifold piping shall be installed for each airlift and shall be equipped with a valve for fine adjustment or shut-off.

The airlift proper shall be constructed of schedule forty galvanized steel pipe and schedule forty galvanized malleable iron fittings. A removable cleanout plug shall be installed at the top of the vertical airlift pipe. The airlift discharge line shall return settled sludge to the inlet end of the aeration chamber at a point which prevents short circuiting and provides a positive visible return.

The airlift pump inlet shall be equipped with an inlet bell and pedestal legs. The legs shall be used to position the inlet correctly at the base of the hopper. Inlets that are cantilevered or cut out to rest on the bottom of the hopper will restrict flow and shall not be considered. The pump inlet bell shall be connected directly to the airlift inlet and shall enlarge the inlet sufficiently to reduce airlift blockage or plugging.

The airlift sludge return system shall be designed and manufactured of adequate size pipe and supplied with sufficient air flow to accomplish a pumping rate in excess of the average daily flow. The air flow required to achieve this rate shall be provided in addition to the air requirement supplied for aeration, mixing and treatment.

AIRLIFT SURFACE SKIMMING SYSTEM

A galvanized airlift surface skimmer shall be installed in the settling zone of each clarification chamber. Air shall be supplied to the airlift skimmer through a secondary air distribution system connected to the main air header of the treatment plant. Individual air manifold piping shall be installed for each airlift and shall be equipped with a valve for fine adjustment or shut-off.

The airlift skimmer proper shall be constructed of schedule forty galvanized steel pipe and schedule forty galvanized malleable iron fittings. A removable cleanout plug shall be installed at the top of the vertical airlift pipe. The skimmer shall be constructed of one continuous length of galvanized pipe formed into a twenty inch diameter return bend contour to pump from the chamber surface to the horizontal discharge line. Skimmers constructed with acute angle bends or submerged fittings are susceptible to plugging and shall not be considered. The horizontal discharge line shall return material collected from the surface of the clarifier to the aeration chamber at a point which provides a positive visible return.

The skimmer inlet shall be equipped with an adjustable polystyrene plastic cone. The inlet cone shall be provided with a flexible connector for installation and adjustment. The diameter of the inlet cone shall be at least three times larger than the diameter of the airlift pipe to insure acceptable skimming velocities.

MECHANICAL EQUIPMENT

The air required for the treatment process and airlift operation shall be provided by _____ Model _____ Roots-Connersville blowers or equal. The blowers shall be of the rotary positive displacement type and shall provide _____ CFM of free air at the rated operating pressure of _____ PSI. Each blower unit shall be provided with an inlet air filter/silencer, flexible discharge coupling, and shall be connected to the air header assembly by a main air supply manifold complete with a discharge pressure relief valve. When a standby blower unit is provided, discharge check valves shall be included for each blower unit. Blower connection to the drive motor shall utilize an industrial power transmission drive system.

One seventeen hundred fifty RPM, _____ volt, _____ phase, 60 Hertz, _____ horsepower, open, drip-proof electric motor shall be used to drive each blower. When operating at the rated horsepower the motor shall reach a maximum speed that exceeds ninety-seven percent of the referenced synchronous speed. Motors for the facility shall be designed and rated for continuous duty applications and shall not exceed nameplate ratings when operating as outlined for this facility. Motors shall be mounted on an adjustable slide base for ease of motor alignment and belt tension adjustment.

Mechanical equipment shall be mounted in a non-corrosive weatherproof enclosure. Each enclosure shall be constructed of heavy fiberglass for maximum protection and durability. The enclosure shall consist of a reinforced base and a steel reinforced hood section. The base shall be sufficiently reinforced to withstand all normal motor-blower operating stresses. The hood section shall protect all internal components against environmental forces and protect personnel against injury. The hood section shall be attached to the base with a non-ferrous continuous hinge. The enclosure assembly shall include a hood section handle, retainer cord, and latch complete with a pin tumbler type padlock that is a part of the master-keyed system used for tank openings, control cabinets, equipment housings and related equipment.

ELECTRICAL CONTROLS

Electrical controls shall be installed within the weatherproof cabinet which houses the motor and blower unit. The cabinet shall be equipped with a master-keyed locking device to restrict access to the controls to authorized personnel. Controls shall include: _____ volt, _____ phase motor control center with across-the-line switch type starter, circuit breaker and thermal overload protection. The motor control center shall be factory-wired to the motor with a resilient power cable and tested under actual operating conditions prior to shipment to the jobsite.

TIME CLOCK (OPTIONAL)

The motor control center shall include a twenty-four hour time clock, adjustable in fifteen minute increments, to permit cyclical automatic operation of the treatment facility. A three position “Hand-Off-Auto” toggle selector switch shall be installed for each blower unit supplied to allow the unit to operate continuously when in the “Hand” position or cyclically according to the cycle established on the time clock when in the “Auto” position.

GALVANIZED METAL GRATING

Tank openings shall be protected with galvanized metal grating padlocked in position. Individual lock bar assemblies shall be provided for each tank opening. Pin tumbler type padlocks shall be used to secure each grating section and the locks shall be part of the master-keyed system used for tank openings, control cabinets, equipment housings and related equipment. To permit easy removal and handling, individual grating sections shall weigh not more than fifty pounds each and shall measure not more than forty-five inches in width or five feet in length. They shall be of sufficient strength to have a deflection which does not exceed one-fourth inch under a distributed load of one hundred pounds per square foot. No more than two individual grating sections shall be used to cover individual tank openings. Slat type loose or unsecured grating shall not be used. The galvanized safety grating shall also be used as a leaf screen to prevent entry of leaves and discarded debris into the tankage. Therefore, maximum width of individual openings within the grating proper shall not exceed three-fourths of an inch.

CORROSION PROTECTION

After completion of welding, all steel surfaces of the treatment plant equipment shall be blasted to white metal. All surfaces shall be primed with one coat of strontium chromate primer thinned ten percent with epoxy thinner, for a dry thickness of one and one-half mils. After a minimum of eight hours drying time, two coats of catalyzed PPG Aquapon shall be applied, one coat in a horizontal spray pattern and one coat in a vertical spray pattern. This shall produce a four to six mil total dry thickness on the interior surfaces and six to nine mil total dry thickness on the exterior surfaces.

The finished interior and exterior color shall be Norweco green. The plant manufacturer shall provide sufficient finish coating packaged for field touch-up.

MANUFACTURER

The equipment specified herein shall be the product of a manufacturer having a minimum of five years experience in the construction of prefabricated equipment of this particular type and design. The contractor shall prepare his bid on the basis of the specific equipment and materials specified for purposes of determining the low bid. This is not done, however, to eliminate other products or equipment of equal quality and efficiency. Substitution of equipment may be made if the proposed substitution is superior or equal in construction and performance. If equipment is to be substituted, the contractor shall obtain approval prior to execution and shall, at his expense, prepare and submit revised engineering drawings and specifications for the project. It is assumed that the substitution will result in a reduction of cost to the contractor and, if revised drawings submitted by the contractor are approved, the savings will be passed along in a reduction of the contractor's bid price. After execution of the contract, substitution of equipment of makes other than that specified will not be considered.

WARRANTY

The manufacturer shall warrant the equipment being supplied to the owner against defects in workmanship and materials for a period of one year under normal use and service.

The warranty shall not cover any item which has been subjected to external damage, disassembled and/or repaired by unauthorized persons, flooded or otherwise mistreated. The manufacturer shall not be held liable for any consequential damages or contingent liabilities which are directly or indirectly a result of any failures in materials or equipment, or from delivery or installation delays. Items normally consumed in service such as grease, oil, v-belts, fuses, filters, seals, etc., shall not be warranted.